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The « dispatchnig system » by telephone on the Belgian State Railways,

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Figs. 1 to 20, pp. 334 to 389.

SUMMARY.

CHAPITER I. — *Lines on which the « dispatching system » is already in operation or on which its adoption has been decided upon or is under consideration.*

— II. — *Administrative organisation of the « dispatching system ».*
- a) Principles with which the « dispatchers » and station staffs have to conform.
- b) Description of the telephonic organisation on the section from Brussels to Ciney, which has been taken as an example
- c) Division of the line into sections in connection with the « dispatching system ».
- d) Co-ordination of the work on a line divided into sections or on neighbouring lines which interconnect.
- e) Choice of location of « dispatcher » offices.
- f) Modifications which have been made in the traffic rules on lines on which the system is in vogue.
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— III. — *Choice of the staff.*

— IV. — *Financial results and conclusions.*

The history of the « dispatching system » and its technical organisation on the Belgian State Railways have been set forth by Mr. Lamalle, chief engineer, director of administration of the Belgian State Railways, professor at the University of Louvain, in the *Bulletin of the International Railway Congress Association* for November 1922.

In this article, Mr. Lamalle has shown that from the time it was first put into operation, the system has shown itself to be a factor of very great value in traffic operation.

Its success has exceeded the most optimistic estimates, and the future will certainly confirm the efficacy of this new method of railway operation.

In Belgium, as in many other countries, the « dispatching system » has passed from the experimental stage and has become an established practice. The new organisation has developed very rapidly, and on lines which carry heavy traffic but which are not yet worked on this system, one feels that they are being worked under unsatisfactory conditions.

The object of this article is to show the ground covered since the institution of this new method of controlling the running and the composition of trains, and to explain the administrative organisation, and also to give useful information on the subject.

CHAPTER I.

Lines on which the « dispatching system » is already in operation or on which its adoption has been decided upon or is under consideration.

The following lines of the Belgian State Railways, all of which are double track and which amount in all to 508 km. (316 miles), are at the present time operated by means of the « dispatching system » (fig. 1) :

SECTION OF LINE.	Length, in kilometres (in miles), of the line.	Length, in kilometres (in miles), of the two-wire telephone circuit [1].	Date on which the « dispatching system » was instituted.
Brussels to Namur	62 (39)	2 circuits each of 108 km. (67 miles)	1 October 1921.
Namur to Ciney	29 (18)		17 April 1923.
Ciney to Arlon	108 (67)	2 circuits each of 135 km. (84 miles)	15 December 1922.
Brussels to Ans	94 (58)	2 circuits each of 120 km. (74.5 miles)	1 June 1922.
Ans to Herbesthal	47 (29)	1 circuit of 70 km. (44 miles)	15 September 1922.
Brussels West Suburban	27 (17)	1 circuit of 35 km. (22 miles)	7 August 1922.
Brussels to Denderleeuw	24 (15)	1 circuit of 200 km. (124 miles)	11 September 1922.
Denderleeuw to Ghent	47 (29)		25 September 1922.
Ghent to Ostend	70 (44)		27 September 1922.

(1) The circuits are of insulated bronze wire (Hacketal) of 2 mm.8 (0.110 inch) diameter.

The difference between the length of the railway and of its two-wire telephone circuit arises from the fact that it is necessary to include in the circuit certain stations and engine sheds which are situated off the main line or on lines branching from it. These off shoots of the telephone circuit which are known as « antennes » are found to be necessary :

1° to obtain advice in sufficient time of trains running ahead of booked timings or of special trains which are approaching the line on which the system is in operation;

2° to ascertain the volume of traffic which has to be dealt with by the line;

3° to keep in touch with the engine sheds which, although not situated on the line on which the system is in operation, are concerned in operating the trains which run on this line.

For these reasons, these branch telephones have been provided to the stations and engine sheds at Schaerbeek, Ronet, Bertrix, Virton, Sterpenich and Athus, in the case of the line from North Brussels to Arlon; to the stations and engine sheds at East Ans, Liers, Liége-Vivegnis, Renory and Kinkempois, on the line from North Brussels to Herbesthal; to the stations and engine sheds of Schaerbeek, Jette, Brussels-Tour-et-Taxis, South Brussels, Uccle-Calevoet and Forest-Midi, for the Brussels West Suberban line, to the stations and engine sheds at South Gentbrugge, North Gentbrugge, East Ghent, Ghent-Nouveau-Bassin-Formation, Gontrode and Termonde for the line from North Brussels to Ostend.

* * *

As the Minister of Railways has stated in the course of the discussion on the budget, « the use of the ' dispatching system ', which has given very good results, has been largely extended during the year 1922, and it will continue to be extended gradually ».

Since that time, the new system has been decided upon for the following lines :

1° The line from Namur to Luttre via Charleroi (with telephonic branch lines to the stations and engine sheds at Roctiau, Ransart, Lodelinsart, Piéton, Trazegnies, Courcelles, La Sambre, Saint-Martin, Walcourt and Jumet). This district is covered with very busy lines with a large number of engine sheds, marshalling and sorting sidings, and with stations which have a large amount of local traffic;

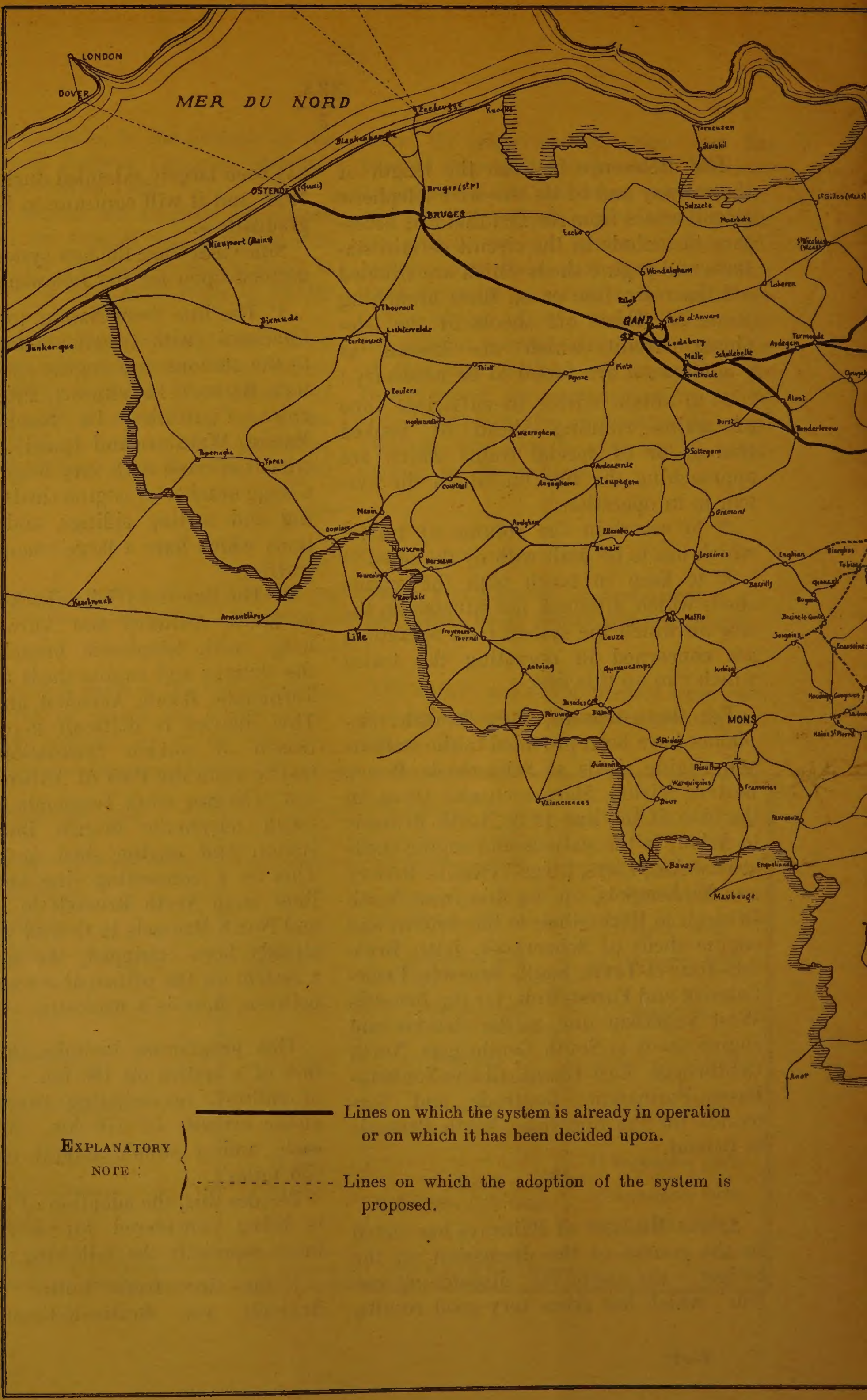
2° The line from Schaerbeek-Formation to South Antwerp and Antwerp-Zurenborg (with telephonic branch lines to the stations and engine sheds at Louvain, Termonde, Boom, Aerschot and Lierre). This district is difficult to operate by reason of sudden fluctuations in the traffic from the Port of Antwerp;

3° The line from Termonde to Louvain (with telephonic branch lines to the station and engine shed at Aerschot). This is a connecting line between the lines from North Brussels to Herbesthal and North Brussels to Ostend which have already been equipped; the adoption of a system on the principal connecting line between these is a necessity.

This programme includes the installation of a system on 180 km. (112 miles) of railway, necessitating two-wire telephone circuits of 170 km. (106 miles) each, and a simple circuit of 90 km. (56 miles).

Besides this, the adoption of the system is being considered for several other lines, especially the following :

1° the line from Luttre to South Brussels via Braine-le-Comte (with

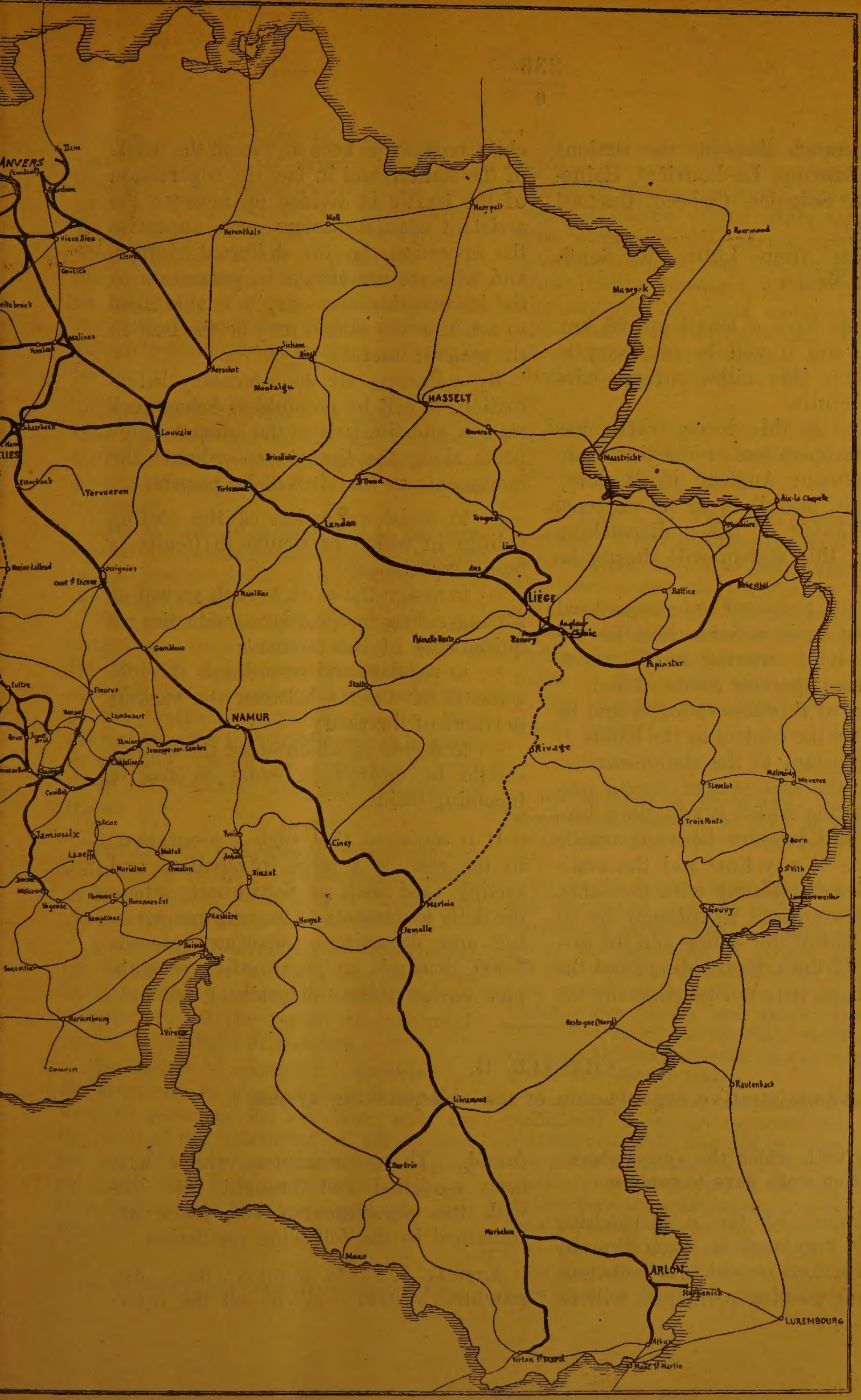


Explanatory note:

Lines on which the system is already in operation or on which it has been decided upon.

Lines on which the adoption of the system is proposed.

Fig. 1. — Map of the Belgian Railways showing lines on which the « dispatchin



em » is already in operation or on which it is decided upon or proposed.

telephonic branch lines to the stations of Piéton, Bascoup, La Louvière, Haine-Saint-Pierre, Soignies, Clabecq, Quenast and Saintes);

2° the line from Luttre to South Brussels via Baulers.

These lines have a length of 98 km. (61 miles), and it will be necessary to erect 200 km. (124 miles) of two-wire telephone circuits.

In addition to this, heavy traffic has rendered the operation of the line from Ourthe (between Angleur to Marloie) very difficult, and it is to be expected that the adoption of the « dispatching system » on this system will shortly be considered.

Finally, it is proposed to create a local « dispatching » post at Schaerbeek for the regulation of the internal traffic movements in this important goods station.

The effect of this innovation would be to concentrate the control in the hands of the chief assistant to the station-master, who, under the new system, would possess information which would allow him to control the relation between traffic requirements at any time and the available facilities for dealing with the same.

At the present time, in consequence of the wide extent of the station and the distance between the arrival sidings and the sorting sidings, it is not possible for the chief assistant to keep an eye on the whole of the station, and in fact the supervision of the traffic is divided up between the assistant station-masters who supervise the operations in the different sidings, and who are not always in possession of the information necessary to enable them to act in a way which may be the best in the general interest.

By collecting all the necessary information, it will be possible at Schaerbeek station, and similarly at the «dispatching» posts along the line, to co-ordinate the movements so that it will be possible

— to assist a portion of the sorting sidings in which particular difficulty is being experienced;

— to assign the work to each arrival or sorting siding in accordance with the requirements of the moment;

— to regulate and co-ordinate the movements of wagons between the various portions of the yard;

— to decide in which order the sidings should be cleared in order to receive incoming trains.

It is apparent that such a programme in the case of a large marshalling and sorting yard such as Schaerbeek, where the daily movements of the wagons (arriving and departing) sometimes exceeds 7 000, demands an organisation as complete as that of the « dispatching system ».

CHAPTER II.

Administrative organisation of the « dispatching system ».

a) Principles with which the « dispatchers » and station staffs have to conform.

The operation of the « dispatching system » is regulated on each line by special instructions in which it is obvious that the same guiding principles will be found. These principles, which have been modified and brought into line with the experience of two years, are contained in the following regulation :

ARTICLE 1. — In practice, the « dispatching system » allows all the information dealing with the running and the composition of trains in a given district to be concentrated in the hands of the « dispatcher ». This official gives, from a central control office, at which he has at his disposal the necessary information, the orders necessary to maintain or regain regularity in the running of the trains and to co-ordinate the operations at the stations and engine sheds.

Article 2. — The « dispatching system » is installed in the offices of the chief of the traffic department, in separate groups, for each of the lines equipped.

The system is placed under the control of the « chief-dispatcher » assisted by a number of « dispatchers » and operates continuously.

The personnel attached to the « dispatching system » office form a part of the traffic department staff however, and the staff is under the direct orders of the traffic department of the other groups on which they operate as regards everything which is concerned with their interference with the running of trains.

Article 3. — A special telephone circuit connects the « dispatching » office to the stations, halts, engine sheds, and certain signal boxes on the line.

A detailed description of the telephonic organisation on each line is issued as a special instruction which is distributed to all the points in communication with the « dispatcher ».

The latter is constantly listening on the line, and to speak to him it is necessary to pick up the receiver, wait for the end of the conversation which may be going on, press down the button, call, and then wait until the « dispatcher » replies and then communicate with him (1).

It is strictly forbidden for any station to use the « dispatching » telephone to speak to another station. Except in the case of failure of the other telephones, this circuit is exclusively reserved for communications with the « dispatcher », these being messages which deal with the running of trains and engines and the location of rolling stock. The order in which these messages are taken is decided upon solely by the « dispatcher ».

Every employee or official, whatever his grade may be, has to conform to this rule.

Article 4. — The « dispatcher » centralises : 1° the information dealing with the running of trains and engines over the lines under his control; 2° information as regards the loading and motive power and the arrangement of special trains (1); 3° alterations which may be made in the motive power required or in the running of regular (1) or conditional trains (1).

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(1) Normally, the transmitter (microphone) is not included in the circuit, only the receiver being included; by pressing down on a button the transmitter is included in the circuit.

(1) On the Belgian State Railways considerable fluctuation occurs in the goods traffic in consequence of the arrival of ships at the sea ports, the periodicity of certain operations, the delivery of large orders, etc. It is therefore necessary, in addition to the regular trains which always run, and to the trains which run at regular intervals which may be regarded as regular trains, to run conditional trains and special trains.

The regular trains, periodical trains and conditional trains are provided for in the working timetable, and the provision of motive power and train crew for these trains is provided for in advance in the appendix to the working timetable which is not departed from except in the case of failure of locomotives, late running or accidents.

On the other hand, in the case of double track lines, it is left to the initiative of the

He transmits to the stations and locomotive sheds concerned, either as a matter of course or on their requesting him to do so, the information which he has received, and he suggests to these stations and engine sheds the best steps to be taken, either in individual cases or as a whole, in order to ensure a regular service.

Article 5. — On the lines on which the system is in operation, the stations and engine sheds send in to the « dispatcher » all the information dealing with the running of trains or consignments so that he can transmit them by telephone to the stations and engine sheds of any other line which is also organised under the « dispatching system ».

However, on the said lines the telegraph is still used for the transmission of information directly dealing with safe working (« block-system » by telegraph, single line working in case of accident, breakage of couplings, breakaways, occurrance of accidents, line occupied by platelayers trolleys, etc.).

Consequently the intervention of the « dispatcher » in sending messages dealing with late running the alteration or

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operating staff to deal with unforeseen rushes of traffic without delay or useless formalities, by means of special trains for which neither motive power or train crews or timings are provided in the working timetable. Diagrams (figs. 2 and 3) show the fluctuations which occur in the sea port traffic and give an idea of the difficulties which are met with in dealing with the flow of traffic by means of regular and special trains and in balancing the circulation of trains in either direction.

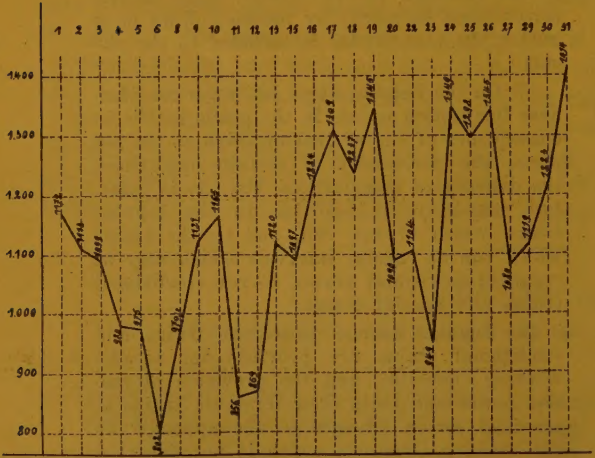

Fig. 2. — Fluctuations which occurred, during the month of October 1923, in the number of empty wagons required at the Port of Antwerp for through traffic.

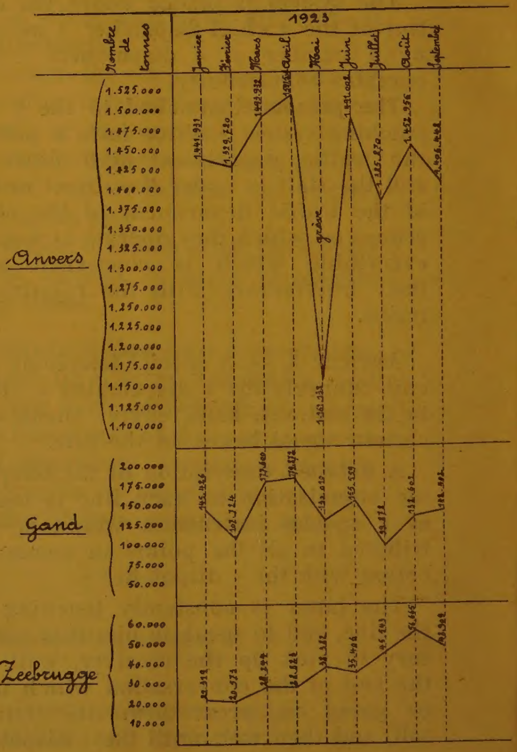

Fig. 3. — Fluctuations in the tonnage entering Belgian ports during the first nine months of 1923.

cancellation of regular trains, the running or cancellation of conditional or special trains, arrangement of timings for special trains, etc., is carried out in accordance with the following rules :

a) He repeats to the station concerned on the lines under his control notices of the probable late running and of passing times which he has received from other stations; he then determines the actual delay which occurred and informs the stations throughout the length of the said line of the delay and of the changes which are to be made in consequence in the order of the running of trains (see also articles 16 and 18);

b) He transmits to the stations and sheds concerned information which he receives from the stations at which the trains are made up, as regards the running of conditional or special trains, or as regards the cancellation of regular trains or of conditional or special trains for which arrangements have been announced (see also articles 16, 17 and 18).

The « dispatcher » may also act as an intermediary between the stations and the running sheds in asking for a change of engine to be made, or for an assisting engine in the case of an engine failure or train which has met with an accident, or to call for the services of the breakdown gang (see article 29). This intervention allows him to keep in touch with the steps taken, but at the present time this is merely done as a supplementary precaution, and he does not relieve any of the stations from responsibility for sending the messages laid down in the regulations.

Article 6. — The « dispatcher » keeps in permanent touch with the stations which experience difficulty in regularly receiving their trains, he co-ordinates the steps to be taken on the lines under his control to assist the service at the stations, and gives orders to the stations at which trains are made up or at wayside stations to cancel, hold back, send by another route or temporarily place in a siding, trains which are apt to congest the lines or the stations to which they are destined.

If these measures cannot be taken without holding up the work at the sending station, the « dispatcher » utilises the sidings along the line and decides, in agreement with the engine sheds and stations concerned, whether the engines and train crews should remain where they are, or be sent home to their sheds.

When several trains follow one another close in front of a faster train, the « dispatcher » informs the stations of the situation and of the available sidings. He prevents slow-trains being put into a siding too soon by informing the stations concerned of the late running, where such occurs, of the fast trains which are following.

Article 7. — The « dispatcher » serves as a liaison between the stations on the lines under his control and the motive power department for the assistance of the trains on these lines which cannot keep time, and informs the engine sheds of the most urgent cases (see also article 23).

He suggests to the engine sheds the allocation of motive power which appears to him feasible with the engines which are as a rule found on the lines under his control.

Article 8. — The « dispatcher » assists the motive power department by accelerating the movement of trains and engines, and by reducing the standing time of locomotives in the stations, by advising the sheds of the probable hour of arrival of trains worked throughout by one engine, and of cases where it is necessary to change the engine, and by keeping the sheds in touch with the principal traffic events which may have any influence on the running of the engines.

Article 9. — The « dispatcher »

transmits to the stations under his control, orders which emanate from the office dealing with the distribution of rolling stock (1). He receives the communications which have to be passed on to this office.

During the hours when the said office is closed, he deals with any exceptional

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(1) On the Belgian State Railways the distribution of empty rolling stock is effected by two systems which work side by side : by *distributers* and by *movements of rolling stock which are a matter of routine.*

Every day at a stated hour the stations send in a statement of rolling stock in their possession (wagons, according to category, empty or loaded) and state the quantity of empty stock necessary for the following day. They send in this information in the form of a return to the *distribution office* under whose jurisdiction they come. There is a *distribution office* for each of the eleven divisions of the traffic department. The stations copy the particulars of the return sent to the *distribution office* on a « situation card » which is sent to the head office of the district. The system is divided into 55 districts, each having as its head office a station which is well situated as regards its train service to receive quickly the « situation cards ».

As these cards are received, the district office makes a summary of the contents and sends in the total, either by telephone or telegraph, to the *central distribution office* established at head-quarters.

This double advice carried out by the stations results in the central distribution office on the one hand being informed of the number and category of the wagons at the stations and of the wagons necessary for each of the eleven traffic divisions, and also informs the eleven distribution offices of the supply and demand of rolling stock at the stations under their control.

While the central distribution office makes a suitable distribution of the empty rolling stock between the eleven divisions, the latter, by means of their distribution office, adjust the supply and demand between their various stations.

The routine movements of rolling stock consists in the dispatch of empty wagons as a permanent arrangement to certain definite destinations. In order to expedite the process, the station does not have to receive an order to dispatch wagons, but it may send these according to their category as soon as they are unloaded (unless they receive orders to the contrary from the distribution office) to one of the destinations laid down in the permanent instructions; these being, coal mining districts, iron works, quarries, corn depots, large towns, etc., which have a constant need of rolling stock of a particular kind.

With such an organisation, the « dispatcher » has no need to interfere directly with the distribution of rolling stock, but his function is rather to establish direct and rapid contact between the distribution office and the stations, and thereby facilitates an efficient utilisation of the rolling stock. He endeavours to find means of effecting a quicker and more economical method of conveying wagons to their destination and modifies, with this end in view, the make-up of the trains. The following examples illustrate the point :

a) The distribution office at Namur gives orders to Etterbeek (fig. 4) to send 35 covered wagons to Hougaerde, and the dispatching office at North Brussels instructs Schaerbeek to send 50 covered wagons to North Haren. If there is not enough accommodation on the regular trains, Etterbeek would have to send the rolling stock by special train via Gembloux.

The « dispatcher » sends the wagons to Hougaerde from Schaerbeek via Louvain-Tirlemont by means of a regular train on which there is accommodation, and Etterbeek, which has to provide wagons for North Haren, can also do so by means of a regular train.

In addition to other advantages, this arrangement saves 24 hours in the loading of the empty stock at Hougaerde;

b) The distribution office of North Brussels instructs Schaerbeek (fig. 5) to send 50 open wagons to Tamines.

If there is no accommodation on the regular trains, Schaerbeek proposes to send a special train to Gembloux, which is the junction with the single line to Tamines. The « dispatcher » puts at the disposal of Schaerbeek, two locomotives which are returning to Ronet, and he sends the train to Ronet via Namur, which results in a regular train going to Tamines with sufficient accommodation. The route through Gembloux would have necessitated a circumstances which may arise in the distribution of the rolling stock.

ARTICLE 10. — The « dispatcher » shows graphically the actual running of the trains, for which purpose he plots on a diagram (1) the departure times of trains or engines, and as they proceed along the line, the passing times at different places.

In this way the « dispatcher » at any moment has a diagram of the trains running on the line and consequently is in the position to give very precise information to the stations (2).

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high cost for motive power, and it would have held up the empty stock at that station during seven hours of the night while waiting for single line operation to be recommenced.

(1) On this diagram the time is plotted horizontally and the distance between the stations vertically this results in a graph in which the lines representing the running of trains pass from the bottom to the top or from the top to the bottom. The scales for the distances depend on the density of the traffic and the length of the line under consideration. The scale of time is equal to 3 mm. (0.118 inch) per minute, as it is necessary to give plenty of room between the lines so as to facilitate reading the graph.

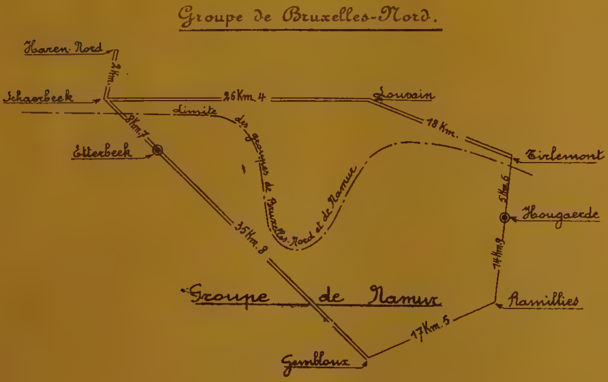

Fig. 4.

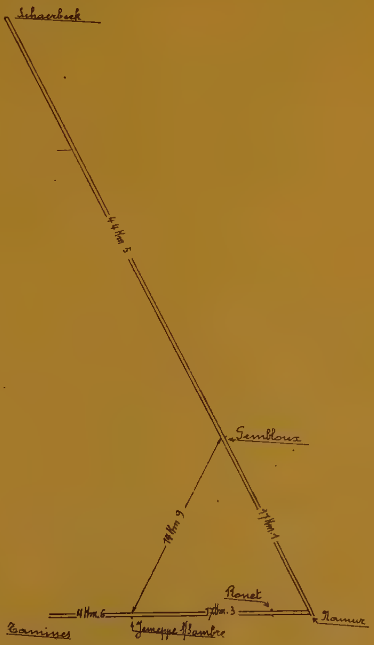

Fig. 5.

Examples of methods adopted by the « dispatcher » with the object of adapting the distribution of empty stock to meet special traffic conditions.

(2) Figures 6 to 9 give diagrams for the running of trains which occurred on the 29 September 1923 in a period of four hours on the line from Brussels to Herbesthal. These diagrams are applicable to trains running in both directions, or may be separated into diagrams for either direction, according to whether there is one « dispatcher » for both directions or a separate « dispatcher » for each direction.

It may be seen by means of the analysis made in the margin of each of these charts :

1° that the figures marked against the commencement and ending of each oblique line represent the delay expressed in minutes if pre-

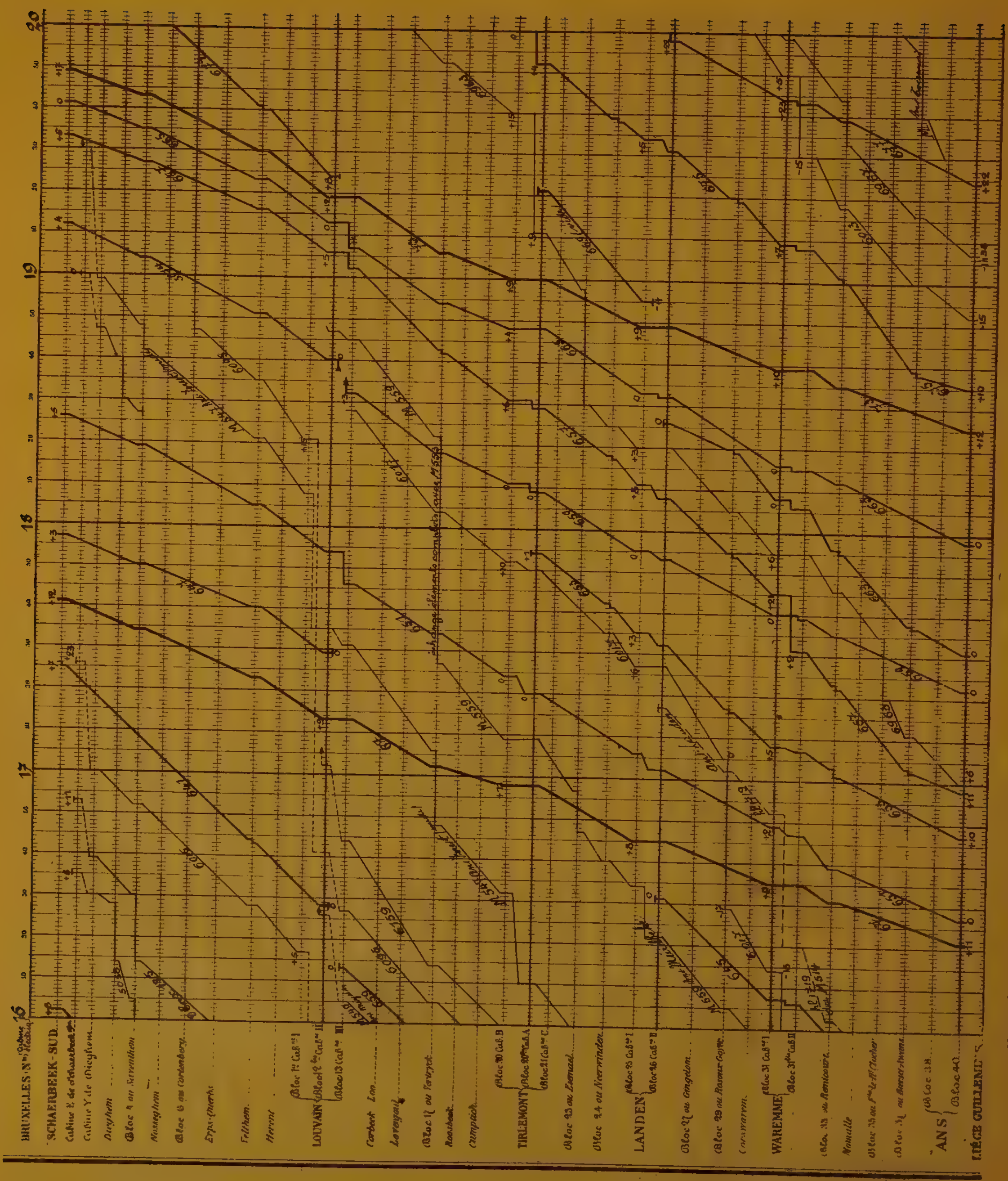

Fig. 6. — Copy of a chart kept by the « dispatcher » for the section North Brussels to Ans (in the direction of running Ans to Brussels).

It follows that he is in a position :

1° To make a better selection of the time when shunting, which occupies the main line, can be carried out;

2° To be able to say for certain if a certain siding is occupied or not, the occupation of sidings being indicated by a special notation;

3° To determine into which siding a train should be put in order to make way for another;

4° To be advised by means of the graph of a prolonged stop of a train on the main line or of the irregular running of a train, etc.;

5° To keep in touch with the running of light engines and of the time at which they return to the shed.

This chart enables him to remedy any

SHORT ANALYSIS :

1. International train 67 enters the line 11 minutes late; Tirlemont station, which is at once correctly informed by the « dispatcher », may send on the special train from Ans to Forest-Midi to be put into a siding at Vertryck. Without a « dispatching system » the delay caused to train 67 on the Liége gradients would not have been known sufficiently soon at Tirlemont.
2. Knowing the exact position of through trains 665 and 73, which are 4 and 9 minutes late respectively, avoids stopping train 657, which is 6 minutes late, from being put into a siding at Vertryck. Under the old system, the late running of trains 665 and 73 would not have been known, and train 657 would have been put into a siding.
3. An Antwerp engine which has been stabled at Kinkempois works, when leaving Ans, goods train 6967, which could thus run ahead of time, and as a special arrangement pick up wagons at Landen. This early departure from Ans is of great assistance to that station. As regards the engine and train crew which would have worked train 6967, they work a special train from Ans to Tournai.
4. A special train is enabled to run the maximum distance without being put into a siding between trains 67 and 651, and the same is the case for the goods trains which preceded train 677 which is running late.
5. The dispatching from Waremme of goods train 6017, 16 minutes ahead of time, allows Rosoux-Goyer to send off this train to time. If it was held back at Waremme until the booked departure time, train 6017 would run after train 651, and the shunting operations at Rosoux-Goyer would make it necessary to wait there until trains 653, 659 and 657 had passed, and therefore train 6017 would be completely put out of its timing, which would also affect the running of train 6963.

EXPLANATORY NOTE.

▬▬▬▬▬	International train.
━━━━━	Passenger train.
─────	Goods train.
- - - - - - - - - -	Light engine.
M: . . . . =	Special goods train.
bnx. . . . =	Train run in accordance with instructions from head-quarters.
hl. . . . . =	Engine.
hlm. . . . =	Goods engine.
all . . . . =	Assisting engine on the Liége gradient.

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ceded by a + sign or the amount ahead of time is the sign is —;

2° that the classification of trains on the Belgian State Railways is as follows :

Nos. 1 to 199.. ...	International trains and international trains « de luxe »;
Nos. 200 to 4999......	Ordinary passenger trains;
Nos. D1, D2, etc......	Sunday passenger trains;
Nos. 5000 to 5999...	Parcels trains;
Nos. 6000 to 10999...	Goods trains;
Nos. 11000 to 11899...	Mineral trains (stone, lime, cement, etc.);
Nos. 11900 to 12199...	Cattle and pigeon trains;
Nos. 12200 to 12699...	Beetroot trains;
Nos. 12700 to 12999...	Local goods trains running on the Liége gradient;
Nos. 13000 to 13999 ..	Local trains running on lines not used for passenger traffic;
Nos. 14000 to 16999 ..	Passenger engines running light;
Nos. 17000 to 19999...	Goods engines running light;
Bin 1, Bin 2, etc.......	Trains run under instructions from head-quarters;
HKEV....................	Special passenger trains run in accordance with instructions from the stations;
HKEM or M...........	Special goods trains run in accordance with instructions from the stations.

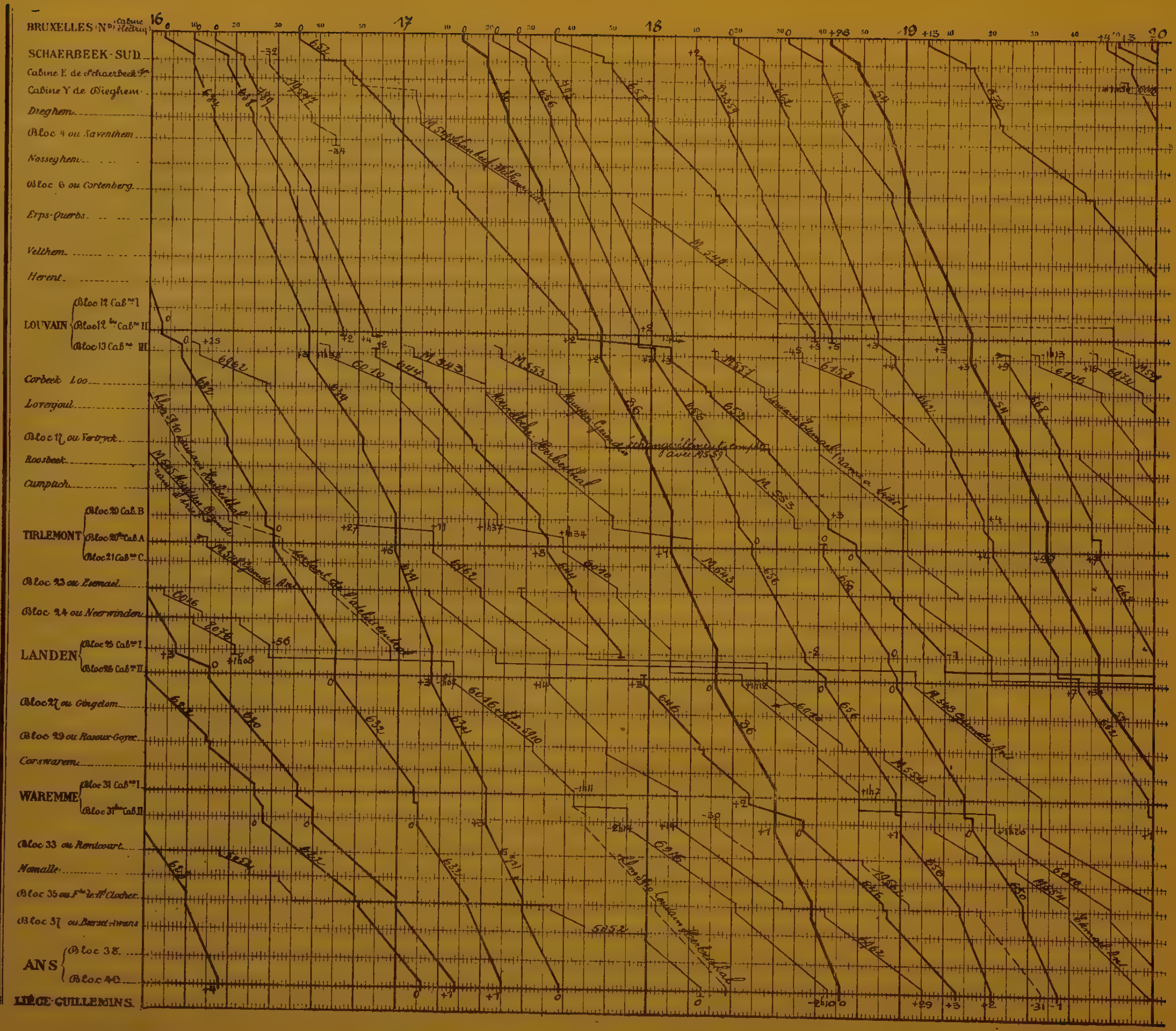

Fig 7. — Copy of a chart kept by the « dispatcher » for the section North Brussels to Ans
(in the direction of running Brussels to Ans)

unsatisfactory features in the running of the trains, and especially the time lost by trains and engines in the stations or on route, the poor utilisation of motive power by the stations and any abnormal standing time of engines working trains that have been put into sidings for an indefinite time.

The « dispatcher » attaches to his daily chart a return showing the irregularities which he has noticed. The head-quarters train office can then compare the chart with the guards' journals, look into the irregularities which have occured, and, if necessary, investigate on their own account, or on the suggestion of the « chief dispatcher », the modifications which it may be well to make in the time-tables in order to facilitate the work of the stations, or to make better use of periods during which the traffic is least dense.

ARTICLE 11. — The « dispatching » staff is organised in such a manner that they go over the line at least twice per month in order that they may be kept in touch with any alterations which have been made in the lay-out of the stations or in the traffic working at the same.

ARTICLE 12. — Necessary steps are taken so that the requirements of the « dispatcher » are immediately met. He is put into possession without delay of information which is described later, and also of any additional information which he may ask for. These arrangements are dealt with in local instructions issued by the station-masters; in these are laid down, in a minute manner, for the guidance of all the station staff, all the information which the local operator should transmit to the « dispatcher ». A copy of these local instructions is sent to the « chief-dispatcher ».

ARTICLE 13. — All the stations and signal boxes concerned have to immediately inform the « dispatcher » of any

SHORT ANALYSIS :

1. The « dispatcher » makes very good use of the engines and train crews provided for hauling special goods trains, and by making use of the secondary stations, avoids the necessity for two reliefs at Tirlemont station : train M559 from Ans to Meirelbeke is taken on to Esemael by engine and train crew from Tirlemont shed; the engine and train crew from Ans which have worked the train, work on the return trip train M554 from Esemael to Ans. The « dispatcher » then carried out at Vertryck the complete exchange of engine and train crew of M559 from Ans to Meirelbeke with that of train M553 from Muysen to Grimde.
2. Goods train 6016 arrives at Landen 56 minutes in advance of the booked time, because the wagons which should have been picked up by that train at Esemael have been taken by train M548 from Grimde to Ans which had to be stopped at Esemael to allow train 632 to pass. Moreover, the early running of train 6016 between Waremme and Ans facilitated the running of train 6010, which was behind time.
3. The late running of international train 54 has not affected the running of goods train 6158 which was dispatched from Louvain 45 minutes before time up to the place where this train has to be put into a siding. This train resumes its normal path on leaving Vertryck after being able, by reason of its early running, to attach some special wagons at that place.

EXPLANATORY NOTE.

—

━━━━	International train.
━━━	Passenger train.
────	Goods train.
- - - - - - - - -	Light engine.
M. . . . . =	Special goods train.
hl. . . . . =	Engine.
hlm. . . . =	Goods engine.
all . . . . =	Assisting engine on the Liége gradient.

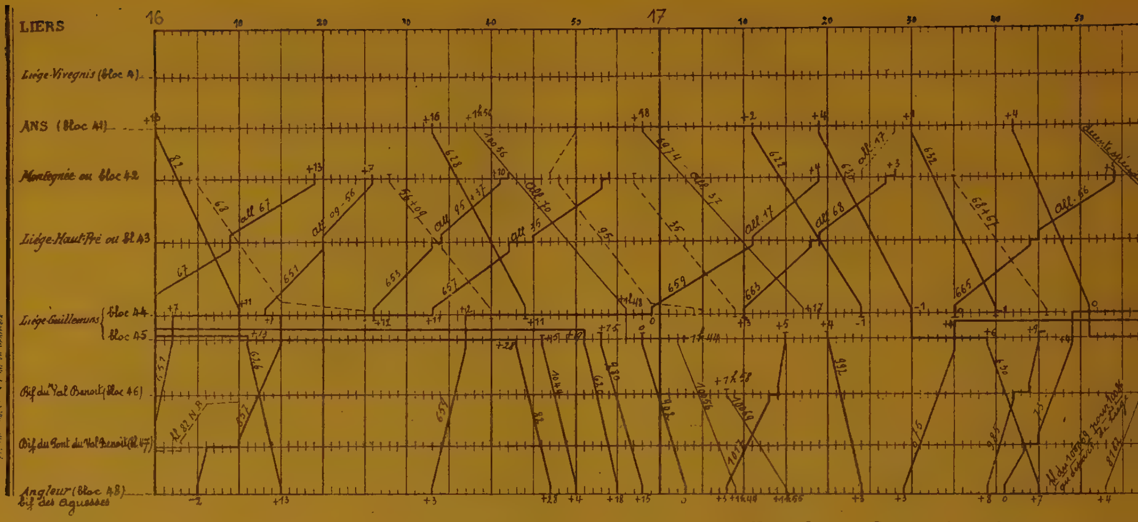

Fig. 8. — Copy of a chart kept by

SHC

changes which they may make in the order or the running of trains (trains put into sidings or cancelled) and exceptional shunting or other operations which may delay a train. They also immediately advise the « dispatcher » of casualties, broken couplings and any other incidents which may have an effect on the regularity or the security of trains, but these advices only serve as information, and do not relieve the stations or signalmen from the necessity of taking the precautions for securing safety which are laid down in the rules.

ARTICLE 14. — As regards advice of the arrival, departure or passing times of engines, only the stations mentioned in a special list published for each line have to do this, and they only do this as laid down in the list. Only one message need be made for arrival and departure in the case of trains which do not stand at the station for more than five minutes.

ARTICLE 15. — The messages should be as brief as possible and without any useless comment (see also article 3, paragraph 3).

Examples :

— Haversin has a message to transmit, it calls « Haversin speaking ».

— The « dispatcher » is ready and says « Haversin go on ».

— Haversin says: « 1284 passed Haversin 19 h. 22 »,

— or « 6946 arrived Haversin 19 h. 10; where are 1284 and 1256? »

— The « dispatcher » repeats information received « 1284 passed Haversin 19 h. 22 »,

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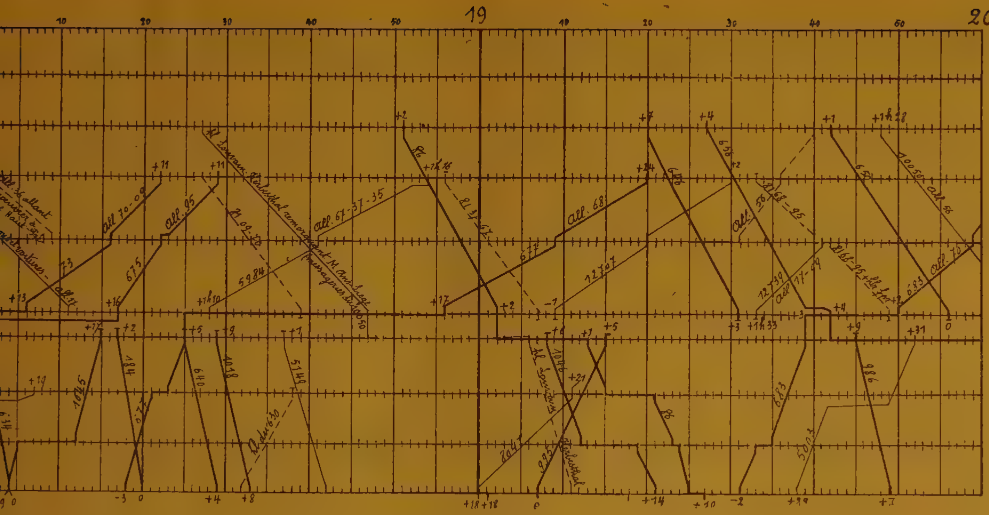
1. It may be noted that the banking engines which do not require coal and water or have no engine duties trip in the minimum time.

2. Engine No. 56, having assisted passenger train 665, is sent for shunting at Liége Station. This work whi of the late running of 10050 and of the use for a special train from Ans to Liége, of a light engine proceed



lispatcher » for the section Ans to Angleur.

NALYSIS :

ntegnée, return to Liége immediately after their arrival at the top of the incline; these engines make the round

ler the old system would have necessitated an additional engine, has been carried out by engine 56 in consequence
n Louvain to Herbesthal; in the ordinary way this work would be done by engine 56.

or « 6946 arrived Haversin 19 h. 10; 1284 and 1256 on time »,

or « 6946 arrived Haversin 19 h. 10; 1256 on time and 1284 RTP (probably late) 45 at Naninne; if 6946 is ready at 19 h. 48 send on ahead of 1284. »

— Haversin closes the conversation by the word : « finished ».

— The « dispatcher » if he has nothing further to say, repeats : « finished ».

In case of great urgency, a station may interrupt a message by calling its name and saying « urgent », « Haversin calling urgent ».

Article 16. — The stations communicate without delay to the « dispatcher », who in accordance with article 5, informs them of the probable and actual late running of trains, the running of trains in special timings, or the cancellation of regular trains or special trains, the running of which has been already advised.

The information supplied by the « dispatcher » only deals with lines on which the « dispatching system » is in operation. It is left to the stations at which these lines end, or which are the stations adjacent to the junctions, where the trains leave the line operated under this system, to repeat in the ordinary way the information obtained from the « dispatcher » to the stations situated outside the district in which the system is in operation.

Article 17. — To order the running of a special train or to cancel a special train, for which instructions have already been given, the station at which the train is made up, or

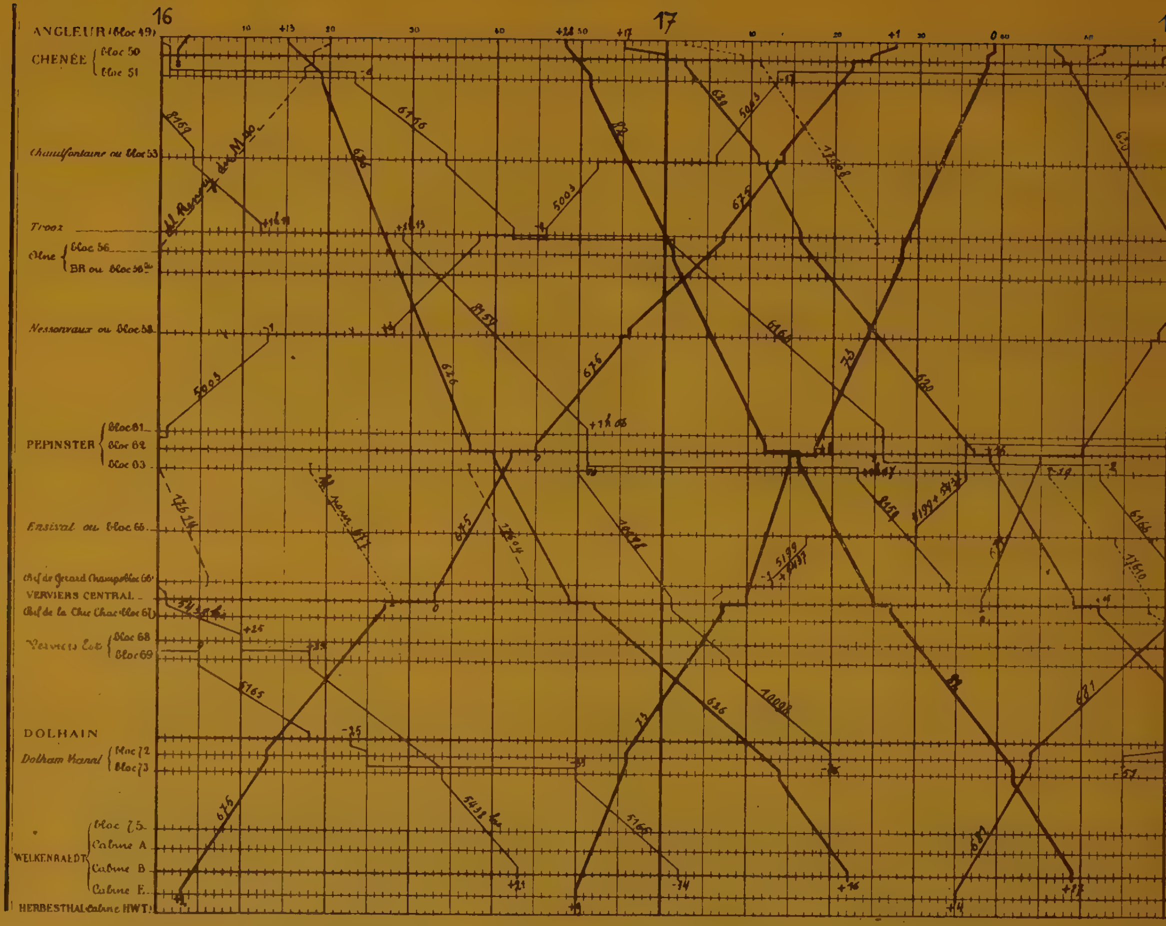


Fig. 9. — Copy of a chart kept by the « dispatcher »

SHORT

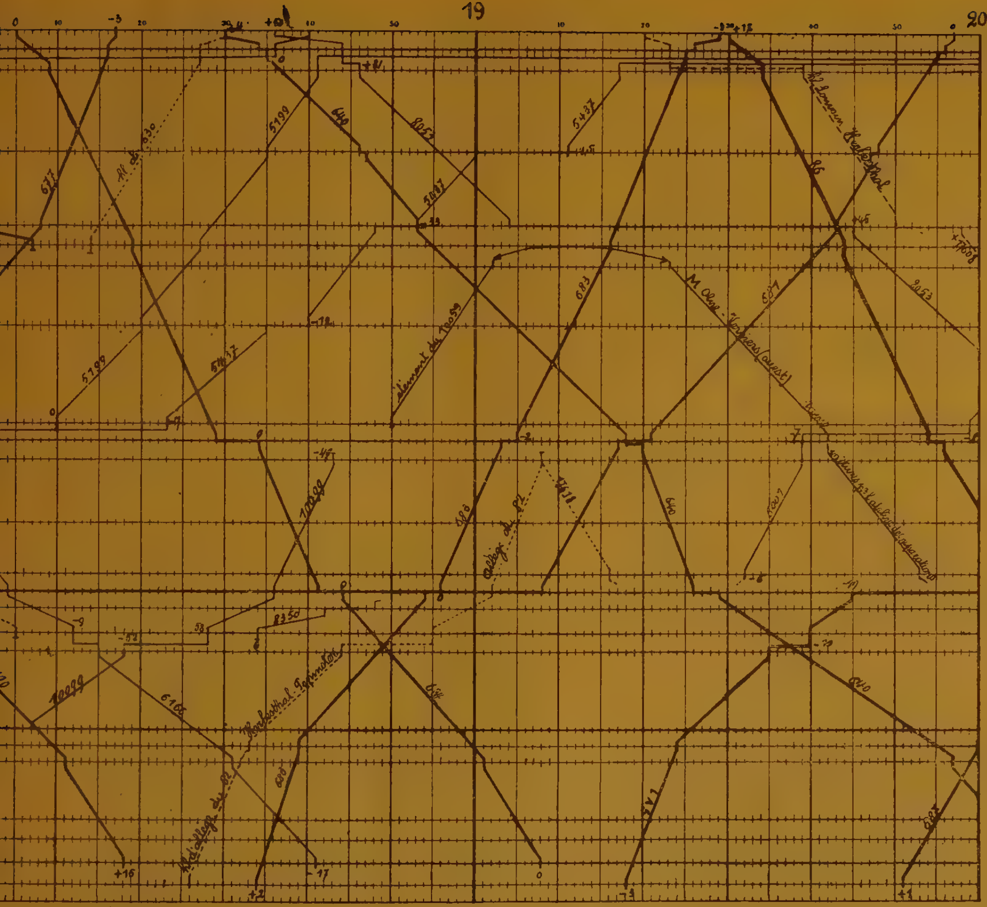
1. It may be noted that goods trains 5437, 6166, 5165,

2. The running before time of goods train 10098 and of return train 10099 allows the motive power and train crews

without inconvenience have been taken by goods train 8053, which is already running late and which

the crossing or junction station, immediately informs the « dispatcher » of the advices which he has to distribute in view of such instructions, and it is the duty of the « dispatcher » to repeat these advices to the stations and sidings concerned on the lines in which the system is in operation.

In the case of a special train or of light engines for which a clear run is to be provided, it is the duty of the stations situated at the ends of the line worked by the system or adjacent to the point where trains branch away from the line operated under the system to repeat in the ordinary manner the ad-



the section Angleur to Herbesthal.

ALYSIS :

3 and 5001 run in advance of the booked timing.

these trains to work a special train of coaching stock from Olne to Verviers-Ouest. These coaches could no
uld have had to leave at Trooz a number of wagons in order to be able to take the coaches to Olne.

vices sent out by the « dispatcher » to the stations situated outside the zone in which the system is in operation, in accordance with the regulations.

Article 18. — As regards advices of the running, cancellation or late running of regular, conditional or special trains, which before passing on to the line worked under the system have to run over a section which is not worked by this system, it is the duty of the « chief-dispatcher » to lay down by a special instruction addressed to the stations concerned, the means by which information as regards the starting or late running of these trains is to be transmitted, as regards the intervention of the « dispatcher » in transmitting this information.

ARTICLE 19. — In order that the provision of reliefs may be carried out on the information of the « dispatcher » within the time laid down for the requisition of motive power for special or conditional trains, or for the announcement of the cancellation of regular trains (4 and 6 hours respectively), it is necessary that the advices mentioned in articles 16 and 17 should be sent to the « dispatcher » as soon as the running or cancellation of the trains has been decided upon.

ARTICLE 20. — It goes without saying that the form of telephonic advice sent to the « dispatcher » on any subject whatever by the station-master must conform with the instructions given on this matter.

ARTICLE 21. — A station-master, before sending a demand to a running shed for an engine to haul a special train running wholely or partially on the line in which the system as in operation, should get into touch with the « dispatcher » in view of the possibility of being able to use an engine which may be found to be available on the line.

If the « dispatcher » is not in a position to assist, the station-master applies to the running shed and telephones without delay to the « dispatcher » the wording of his requisition (1).

ARTICLE 22. — Stations on the line on which the system is in operation, in the case of every special train which is made up thereat, or which originates from some station beyond and which enters the line on which the system is in operation, inform the « dispatcher » without delay of :

— the origin and destination of the train;

— departure time and number of the telegram announcing its departure;

— the load and number of wagons for each point;

— the numbers, types and owing sheds of the engines and the time at which the footplate staff of the engine commenced duty;

— the station providing the head guard and the time at which he commenced duty;

---

(1) The following considerations indicate in what manner the « dispatcher » can best assist :

Although stations at which trains are made up remain the best judges of the need of running a special train or of the time to fix for its departure, the « dispatcher » can advise them, however, to start the train earlier or later, either because the motive power and train crew of a special train running in the opposite direction may be utilised for the return journey, or because exact knowledge of the traffic conditions on the line enable the « dispatcher » to realise that the time chosen for the departure of the train is not one which will allow a good run to be obtained (owing to having to be put into sidings too many times or too much standing time, etc.).

On the other hand, regular trains are not always made up to the maximum load, and the « dispatcher » uses the means of obtaining rapid information which he has at his disposal in order to find the necessary wagons to make up these loads and to obviate either totally or partially the small and incomplete loads waiting for dispatch at the stations.

The « dispatcher » can also investigate :

1° The cancellation at some particular point in its journey of a special goods train of which the loading is light or will be considerably reduced at successive stations;

2° Haulage by one engine only, when the assisting engine, within certain limits, is only necessary on account of a few wagons more than the booked load which can be left behind without any inconvenience.

To sum up, the « dispatcher » endeavours to run both the regular and conditional trains as fully loaded as possible.

— the stations providing the brakesmen and the time which they commenced duty;

These stations give similar information for all cases of special light engine running :

— origin and destination;

— departure time and the number of the telegram announcing its departure;

— number of the train to be worked, or from working which engine is returning to shed;

— numbers, types and owning sheds of the engine and if they are in need of repairs;

— hour at which the footplate staff of each engine commenced duty.

Except when expressly asked by the « dispatcher », the stations need not inform him of the make up of regular or conditional trains, or of particulars of motive power and train crews, if the latter conform with the printed instructions. If there is any discrepancy, the « dispatcher » should be informed of the changes by the station which has put these into effect, if this happens to be on the line on which the system is in operation, or otherwise by the first relieving station on the line operated under the system if the changes have been made before the train passes on to the line so operated.

ARTICLE 23. — In accordance with article 7, and as a check on the general situation, the stations on the line operated under the system give the « dispatcher » daily, at 8.0 a. m., the following information :

1° The regular, conditional and special trains which should run either totally or partially on the line operated under the system and those which are in abeyance;

2° Special trains which it is intended to run on the said line.

These particulars should include :

— the number of train, or in the case of a special train, its origin and destination;

— the number of wagons for each destination and the load;

— the date and hour fixed for the starting time.

ARTICLE 24. — Stations ask the « dispatcher » for any information dealing with the running of trains which may be of use to them.

Thus, for example, a station-master or his assistant who receives a train which has to be shunted or put into a siding should, before commencing operations, announce the arrival of the train to the « dispatcher » so that he may, if necessary, receive from the latter the most up to date information of the running of other trains, the position of which may result in an alteration in the procedure to be carried out by his station.

Before sending forward a slow train, stations should find out how the siding and lay by accommodation ahead is situated in the direction in which the train is running. If the slow train is behind time and is followed after a short interval by a faster train, the stations consult the « dispatcher » as to the possibility of sending forward the first of these trains. Moreover, the stations should be careful, before sending forward a slow train out of its proper running time, to obtain the latest information from the « dispatcher » as regards the position of the faster trains which have previously been announced as running behind time. Finally, before sending away a goods train in advance of its official starting time, the station-master, or his assistant, should get into touch with the « dispatcher » so as to verify when this may be done without affecting the running of subsequent trains or interfering with the working of a station where it is intended to put the train into a siding.

The stations may at any time obtain information from the « dispatcher » as regards the number and position of the trains travelling towards them, and arrange their work in accordance with the information, and if the situation requires it, may ask the « dispatcher » that trains which they are not in a position to receive may be held back in a siding on route (see also article 6).

Article 25. — Stations receive through the « dispatcher » orders from the rolling stock distribution office. They transmit through the same channel any comments on these orders, in addition to any other communication to be made to the said office [see also article 9 (1)].

Article 26. — The new organisation does not cancel or in any way modify the regulations as to the responsibility of the station-master, nor does it interfere in any way with the running sheds.

The station-master remains responsible for the measures which have to be taken in order to assure a regular and safe train service. Moreover, the information which he is able to obtain quickly through the « dispatcher » allows him to act with a full knowledge of the situation, and he will have no excuse for holding back a train in a way which would be unnecessary if he had obtained information from the « dispatcher ».

The « dispatcher », who is better acquainted with the general position than the station-master, can advise him either on his own account, or when asked to do so, as to the best steps to be taken in view of the situation, and makes arrangements with him in order to carry these out.

The « dispatcher » takes responsilility for the advice which he gives, and this responsibility naturally also falls on the station-master if the latter does not strictly comply with the advice or leaves the « dispatcher » in ignorance of facts which may modify the instructions given.

In such cases, the « dispatcher », as representative of the head of the traffic department, may give orders to the stations to hold back, to put in a siding, to send by another route, or to cancel trains which may cause congestion on the line, or in the stations for which they are destined, or to join two trains into one train in cases where this should give any appreciable advantage from the point of view of regularity or economy (see article 6).

Article 27. — The locomotive sheds should not hesitate to ask the « dispatcher » for any information dealing with the running of trains whenever they are affected. They may, for example, at any time, obtain information about the engines working special trains running on the lines operated under the system, and may find out the position and the approximate arrival time at any place of a train which requires to change engines or whose engine is required for a return trip. The engine sheds have no excuse for making a mistake which could have been avoided if information had been obtained from the « dispatcher ». (See also article 8.)

Article 28. — When the sheds receive a demand from the stations for an engine to haul a special train, which will run either partially or totally on a line operated under the « dispatching system », they get into touch with the « dispatcher » with the object of making the most suitable arrangements in view of the general situation. The « dispatcher » as a rule will propose arrangements which appear to him can be carried out with the engines which are normally available on the line operated under the system. (See also article 7.)

Article 29. — On the line operated under the « dispatching system » drivers, who in the course of the journey find it necessary to ask for an assisting engine or to change engines, should get into touch verbally by making a stop, or by slowing down to a very low speed at the first station they come to, so that they may send through the « dispatcher » the request which they think necessary.

ARTICLE 30. — If the relieving trains crews are not available, engine sheds and brakesmen's depots immediately inform the « dispatcher » so that he can, in conjunction with the stations, hold back on route trains which may congest the line and the relieving stations, or may ask the assistance of the neighbour-engine sheds and brakesmen's depots.

ARTICLE 31. — The « dispatcher » does not alter engine workings except in agreement with the motive power department.

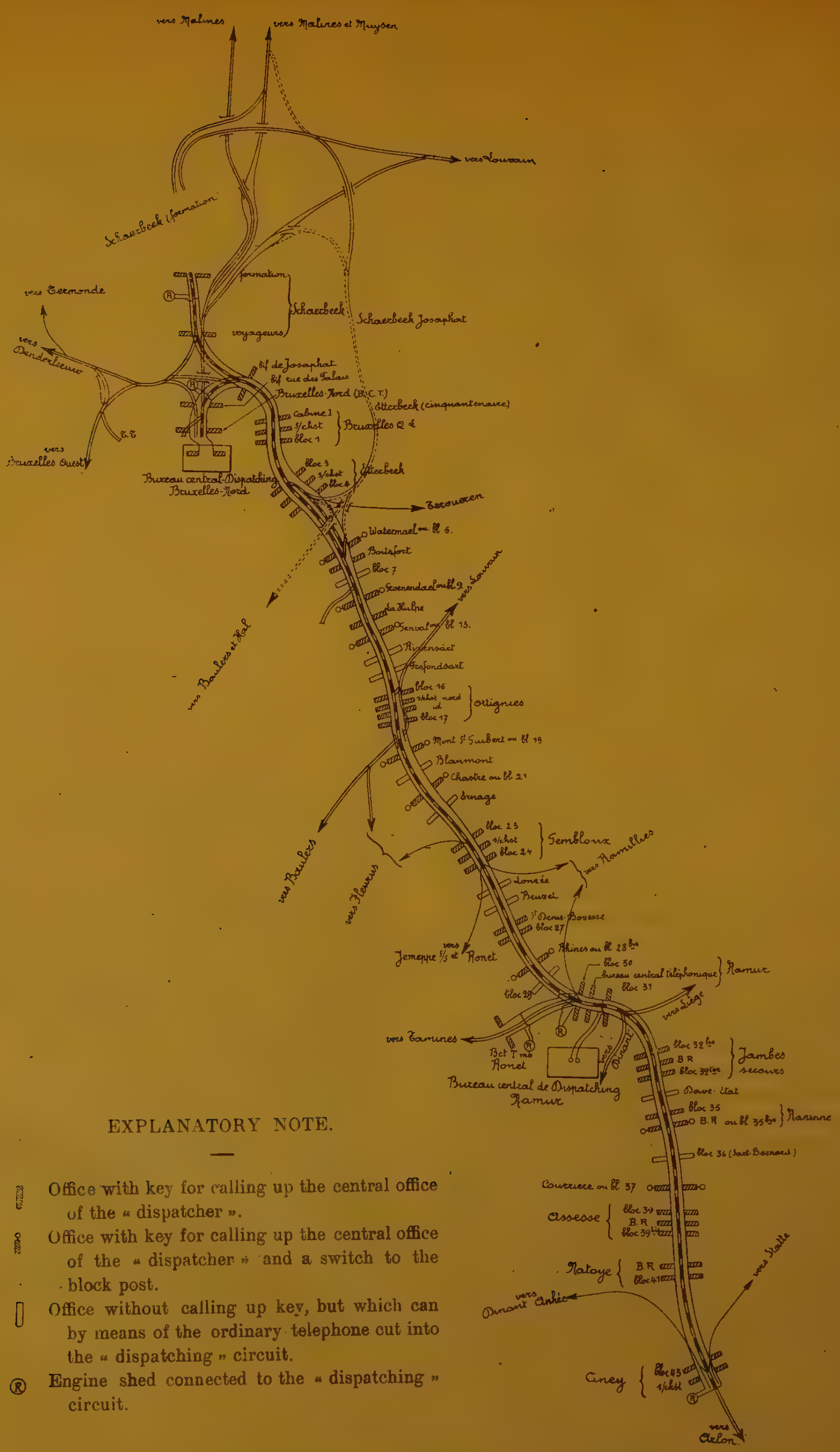
He may, however, having first got the consent of the shed concerned, and where he considers that it is in the interest of the service to do so, alter engine workings provided that they return to their shed, in the limits of the booked time and that they are employed for an equivalent service on the same line.

b) Description of the telephonic organisation on the section from Brussels to Ciney, which has been taken as an example.

We have seen, in article 3 of the preceding chapter, that the telephone organisation for each section of the line is dealt with by local instructions. These instructions give the offices included in the circuit and lay down the information which they have to give automatically to the « dispatcher » and gives some practical hints on the proper use of the telephone apparatus. A map showing the equipment of the section (figs. 10 to 14) and a list of the offices which have to announce the arrival, departure or passing times of trains or engines (table 1) complete the instructions. Unnecessary messages are avoided so as not to throw unnecessary work on the station staffs or on the « dispatcher »; moreover, the supplementary work of keeping in touch with the « dispatcher » is divided between several neighbouring offices, in each case as circumstances demand, and it is possible in this way to avoid any increase in the staff.

On the section from Brussels to Ciney, for example, the offices in permanent connection with both of the two circuits are :

North Brussels (central « dispatching » office);
North Brussels (central station telephone office);
North Brussels (rue des Palais signal box);
North Brussels (engine sheds);
North Brussels (Josaphat Junction signal box);
Schaerbeek (passenger station);
Schaerbeek (engine sheds);
Schaerbeek (marshalling sidings);
Brussels-Quartier-Léopold (signal box No. I);
Brussels-Quartier-Léopold (Assistant station-master's office);
Brussels-Quartier-Léopold (signal box No. II, block 1);
Etterbeek (block 3);
Etterbeek (Assistant station-master's office);
Etterbeek (block 4);
Boitsfort;
La Hulpe;
Ottignies (block 16);
Ottignies (Assistant station-master's office North Station);
Ottignies (Assistant station-master's office South Station);
Ottignies (block 17);
Gembloux (block 23);
Gembloux (Assistant station-master's office);
Gembloux (block 24);



EXPLANATORY NOTE.

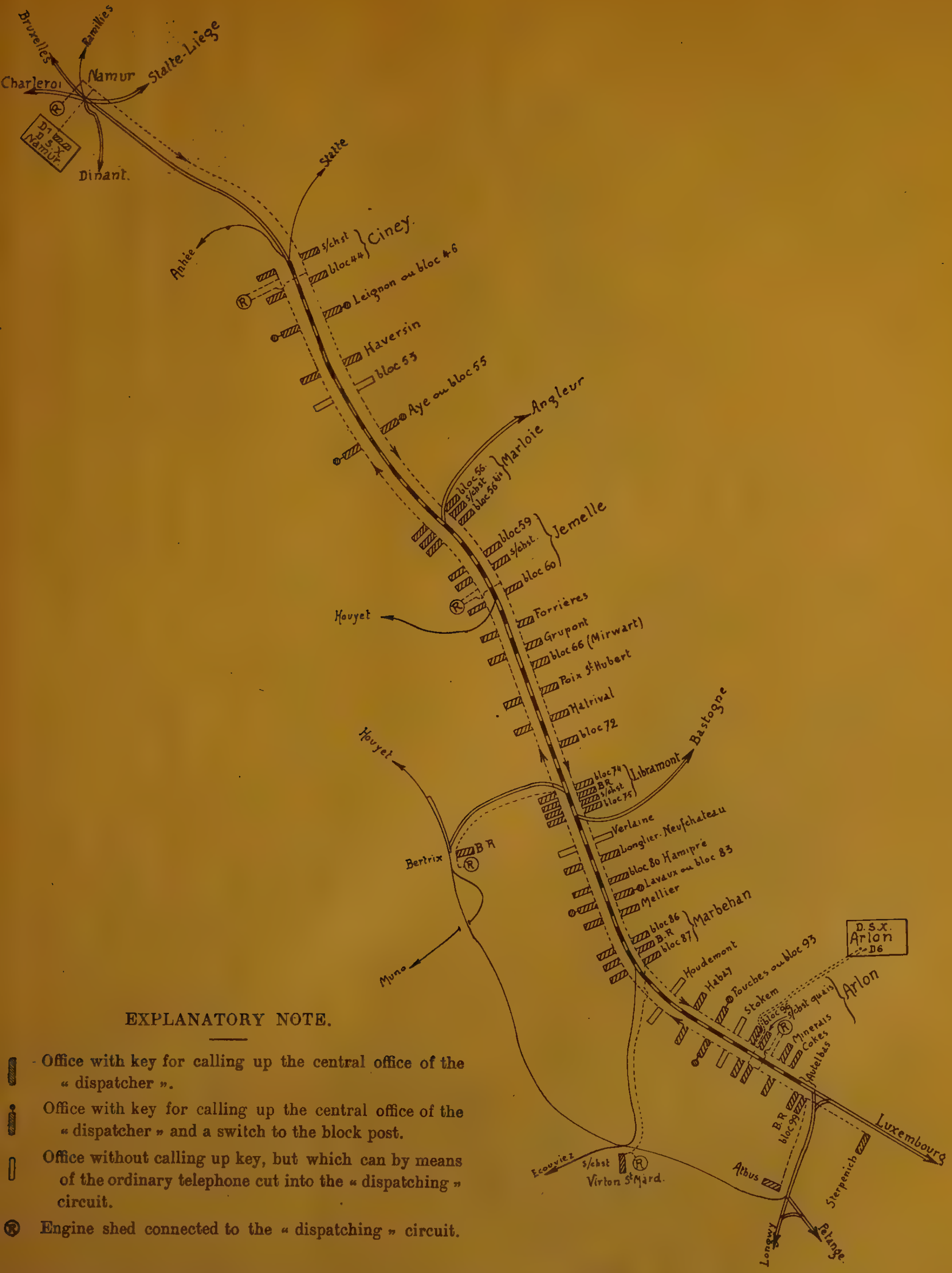
▨ Office with key for calling up the central office of the « dispatcher ».

○▨ Office with key for calling up the central office of the « dispatcher » and a switch to the block post.

▯ Office without calling up key, but which can by means of the ordinary telephone cut into the « dispatching » circuit.

® Engine shed connected to the « dispatching » circuit.

Fig. 10. — Map showing the equipment of the « dispatching system » on the section North Brussels to Ciney.



EXPLANATORY NOTE.

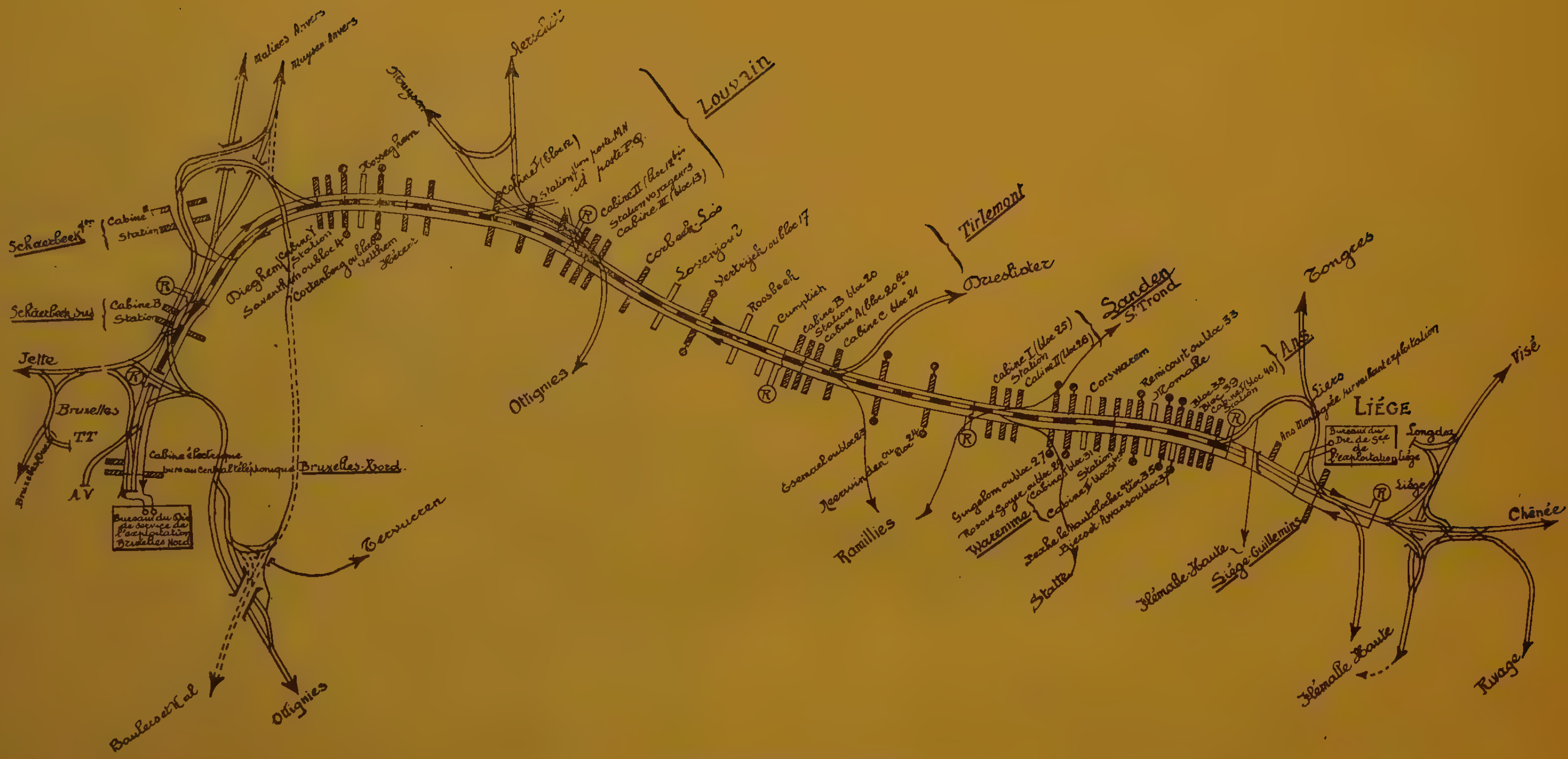
▨ Office with key for calling up the central office of the « dispatcher ».

▨ Office with key for calling up the central office of the « dispatcher » and a switch to the block post.

▯ Office without calling up key, but which can by means of the ordinary telephone cut into the « dispatching » circuit.

® Engine shed connected to the « dispatching » circuit.

Fig. 11. — Map showing the equipment of the « dispatching system » on the section Ciney to Arlon.



EXPLANATORY NOTE.

——→——	« Dispatching » telephone circuit for direction of running Brussels to Ans.
▬ ▬ ▬	
——←——	« Dispatching » telephone circuit for direction of running Ans to Brussels.
▨	Office with key for calling up the central office of the « dispatcher ».
▨	Office with key for calling up the central office of the « dispatcher » and a switch to the block post.
▯	Office without calling up key, but which can by means of the ordinary telephone cut into the « dispatching » circuit.
Ⓡ	Engine shed connected to the « dispatching » circuit.

Fig. 12. — Map showing the equipment of the « dispatching system » North Brussels to Ans.

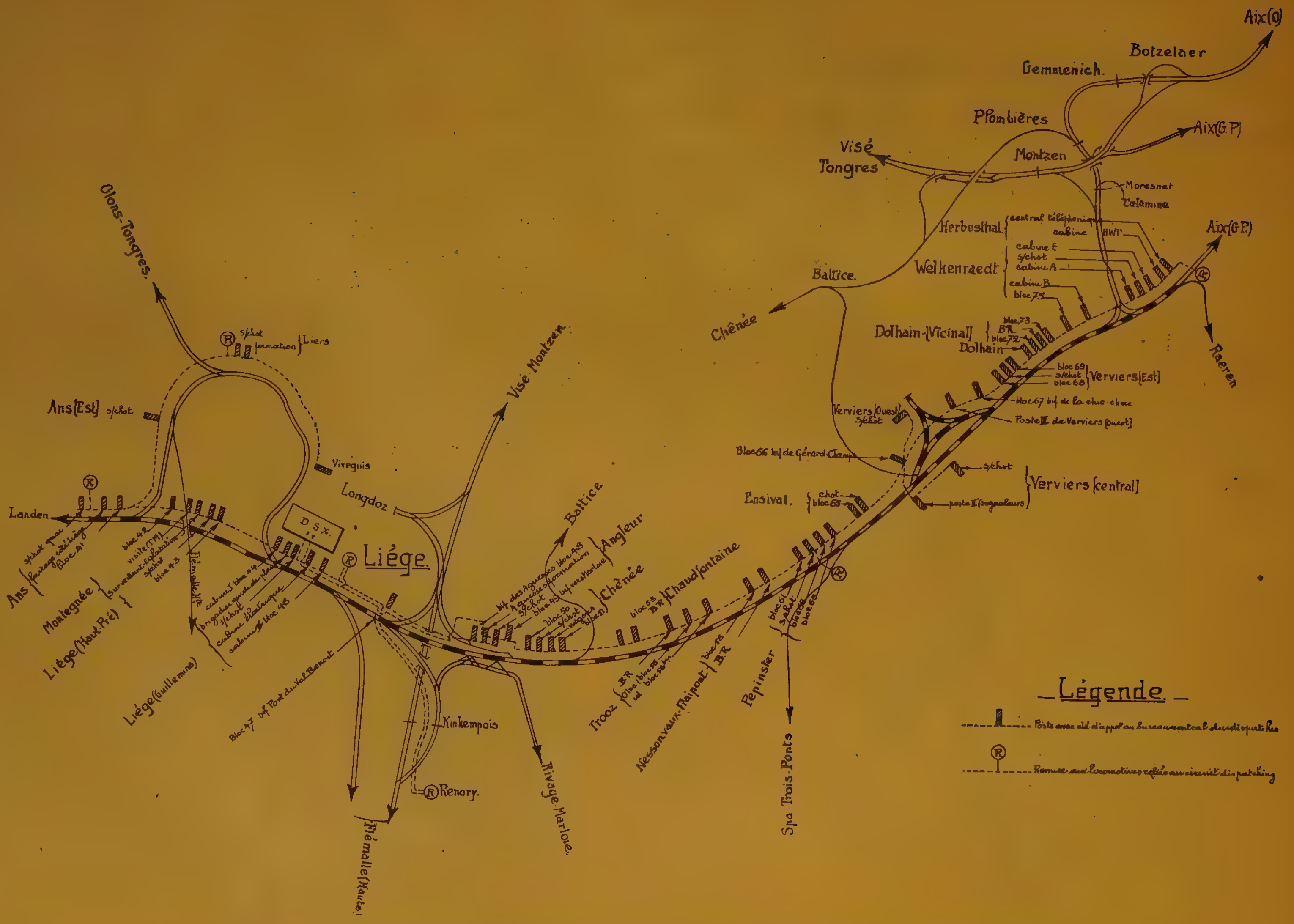
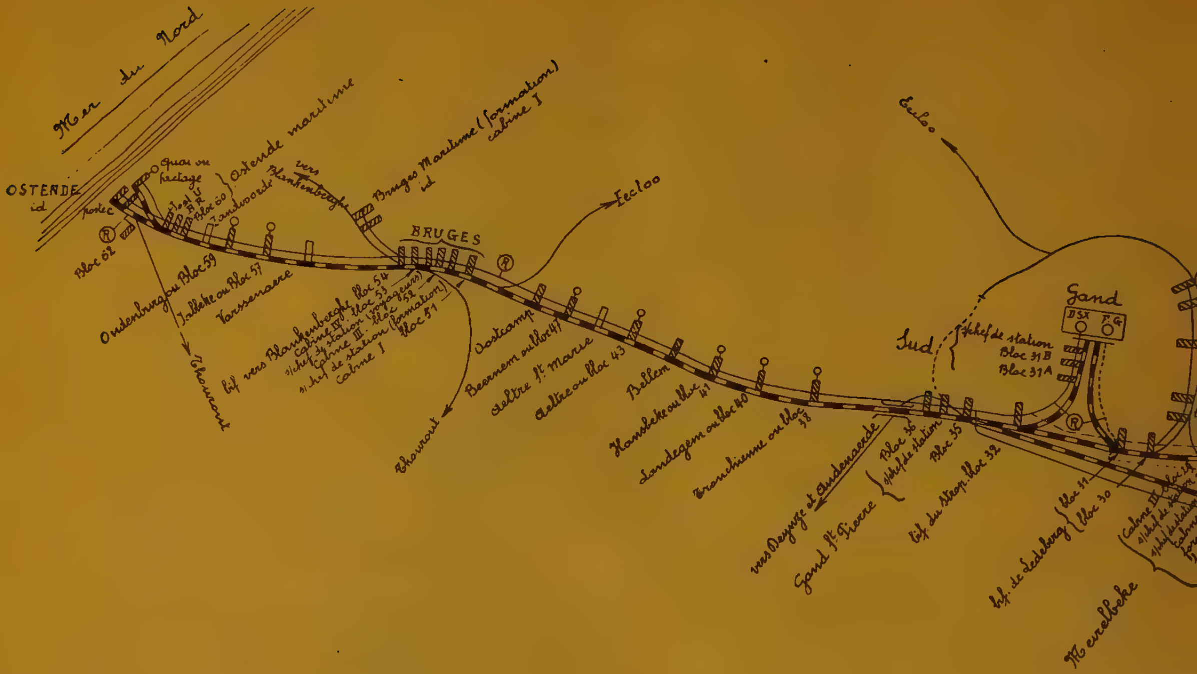


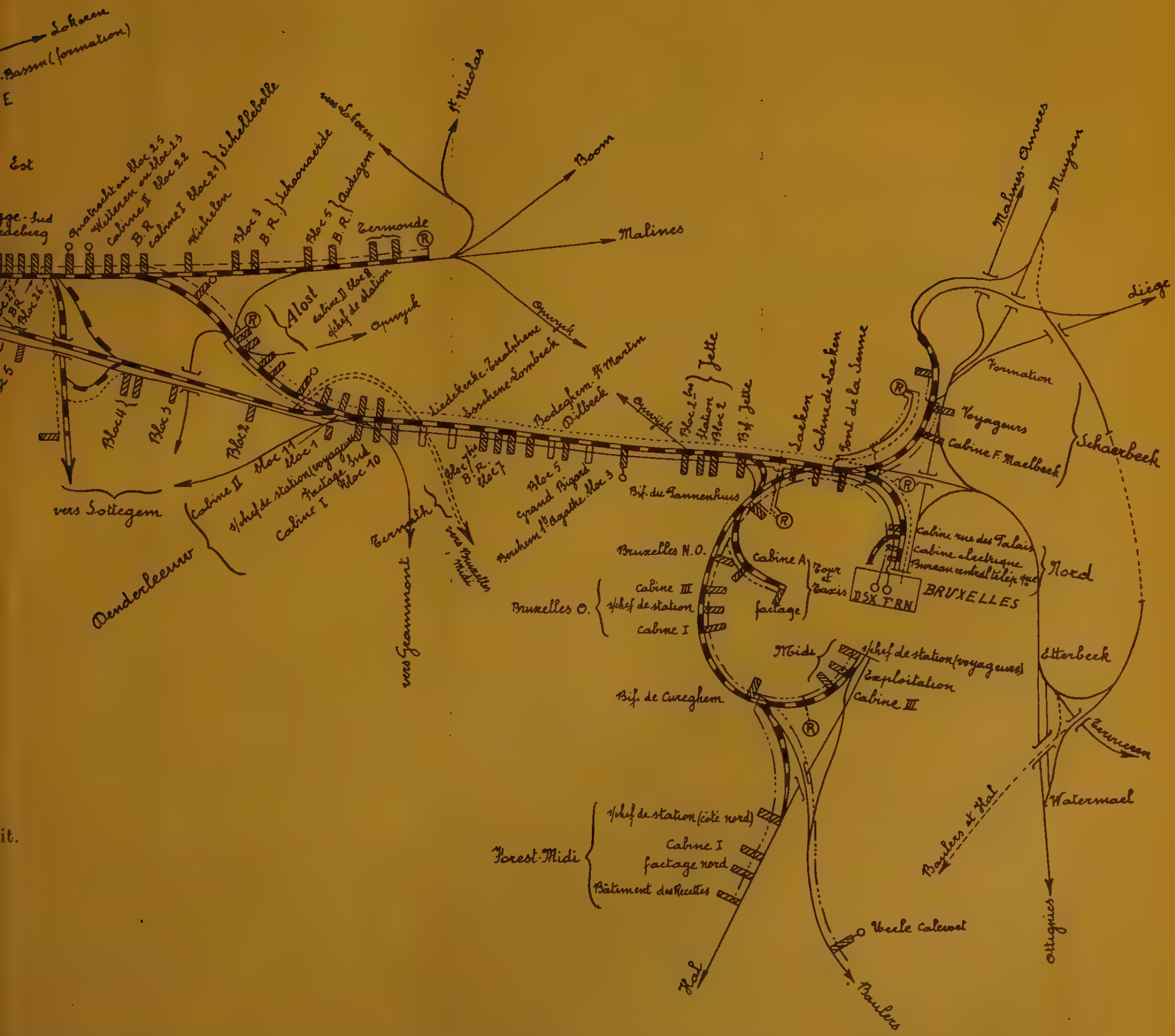
Fig. 13. — Map showing the equipment of the « dispatching system » Ans to Herbesthal.



EXPLANATORY NOTE.

———————	« Dispatching » telephone circuit Ghent to Ostend (with branch line to Denderleeuw via Block 5).
— — — — — —	« Dispatching » telephone circuit Ghent to Denderleeuw and Termonde.
···················	Branch circuit Denderleeuw to Brussels.
———————	« Dispatching » telephone circuit North Brussels to Denderleeuw.
—·—·—·—·—	Branch circuit Denderleeuw to Alost (North).
-·-·-·-·-·-	« Dispatching » telephone circuit Brussels West suburban line.
▨	Office with key for calling up the central office of the « dispatcher ».
▨	Office with key for calling up the central office of the « dispatcher » and a switch to the block post.
▯	Office without calling up key, but which can by means of the ordinary telephone cut into the « dispatching »
Ⓡ	Engine shed connected to the « dispatching » circuit.

Fig. 14. — Map showing the equipment of the « dispatching system »



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Brussels West suburban line and on the line North Brussels to Ostend.

TABLE 1.

Offices which have to report arrival, departure or passing times of trains or engines.	*Direction of running to which these reports apply.*	*Additional information to be given under certain conditions.*
North Brussels (central telephone office).	Only reports passing times of engines running to Brussels (Q.-L.), and gives the trains which they are to work.	
Rue des Palais signal box. . . .	*from* Brussels (Q.-L.).	
Josaphat signal box	*to* and *from* Brussels (Q.-L.), excluding trains and engines running to North Brussels.	
Brussels (Q.-L.), signal box I. .	*to* and *from* Josaphat Junction, excluding trains running to Etterbeek which do not stop at Brussels (Q.-L.).	
Brussels (Q.-L.), signal box II.	*to* and *from* Etterbeek, excluding trains running to Josaphat Junction which do not stop at Brussels (Q.-L.).	
Etterbeek (block No. 3).	*to* Watermael, each report being completed by the words « by fast line » or « by slow line » according to the booked workings of the train or engine.	
Etterbeek (block No. 4).	*to* Watermael, excluding engines and trains running on the fast line.	
Block 5 or Watermael	*to* Etterbeek, each report being completed by the words « by fast line » or « by slow line » according to the booked workings of the train or engine.	
Boitsfort	*to* Groenendael	reports in the other direction of running, arrival and departure times of goods trains and of engines making a booked stop.
Block 9 or Groenendael	*to* Boitsfort	
La Hulpe	*to* Ottignies	
Block 13 or Genval	*to* La Hulpe, each report being completed by the words « by third line » if the train or engine proceeds by the deviation between Genval and La Hulpe.	
Ottignies (block No. 16).	*to* and *from* Profondsart, excluding trains and engines to Mont-Saint-Guibert which are not booked to stop at Ottignies.	

TABLE 1 (*continued*).

Offices which have to report arrival, departure or passing times of trains or engines.	*Direction of running to which these reports apply.*	*Additional information to be given under certain conditions.*
Ottignies (block No. 17)	*to* and *from* Mont-Saint-Guibert, excluding trains and engines running to Profondsart which are not booked to stop at Ottignies.	
Block 19 or Mont-Saint-Guibert.	*to* Blanmont.	reports in the other direction of running, arrival and departure times of goods trains and of engines making a booked stop.
Block 21 or Chastre.	*to* Blanmont.	
Gembloux (block No. 23)	*to* and *from* Ernage, excluding trains and engines running to Lonzée which are not booked to stop at Gembloux.	
Gembloux (block No. 24)	*to* and *from* Lonzée, excluding trains and engines running to Ernage which are not booked to stop at Gembloux.	
Block 27 or Saint-Denis-Bovesse.	*to* Rhisnes.	reports in the other direction of running, arrival and departure times of goods trains and of engines making a booked stop.
Block 28^{bis} or Rhisnes	*to* Saint-Denis-Bovesse	
Namur (block No. 30)	*to* and *from* Rhisnes, excluding trains and engines via Jambes (Secours) which are not booked to stop at Namur.	
Namur (block No. 31)	*to* and *from* Jambes (Secours), excluding trains and engines running to Rhisnes which are not booked to stop at Namur.	
Jambes (Secours) (bl. No. 32^{bis}).	deals with both directions of running, excluding trains and engines which do not stop at Jambes (Secours).	
Jambes (Secours) (bl. No. 32^{ter}).	deals with both directions of running, excluding trains and engines which do not stop at Jambes (Secours).	

TABLE 1 (*continued*).

Offices which have to report arrival, departure or passing times of trains or engines.	*Direction of running to which these reports apply.*	*Additional information to be given under certain conditions.*
Naninne (block No. 35).	*to* Sart-Bernard	reports as regards the other direction of running, the departure times of trains which have been standing on the through siding line.
Block 35*bis* or Naninne	*from* Sart-Bernard	reports as regards the other direction of running, the arrival and departure times of trains and engines which make a booked stop; the departure time is sufficient if a train or engine *coming from Dave* (*State Railway*) have been accommodated on the through siding line; the arrival time is sufficient if a train or engine *coming from Sart-Bernard* has been accommodated on the through siding line.
Assesse (block No. 39)	*to* Florée	reports as regards the other direction of running, the departure times of trains which have been standing on the through siding line.
Block 39*bis* or Assesse.	*from* Florée.	reports as regards the other direction of running, the arrival and departure times of trains or engines making a booked stop; the departure time is sufficient if a train or engine *coming from Courrière* has been accommodated on the through siding line; the arrival time is sufficient if a train or engine *coming from Florée* has been accommodated on the through siding line.
Ciney (block No. 43)	*to* and *from* Natoye.	

Saint-Denis-Bovesse (booking office);
Saint-Denis-Bovesse (block 27);
Namur (block 30);
Namur (engine sheds);
Namur (central station telephone office);
Namur (block 31);
Ronet (central station telephone office);
Ronet (engine sheds);
Jambes-Secours (block 32*bis*);
Jambes-Secours (block 32*ter*);
Jambes-Secours (assistant station-master's office);

Naninne (block 35);
Assesse (block 39);
Assesse (booking office);
Assesse (block 39*bis*);
Natoye (booking office);
Natoye (block 41);
Ciney (block 43);
Ciney (assistant station-master's office);
Ciney (engine sheds).

As regards the following stations, which as a rule are not open at night, during the day the station, and during the night, the signal box, are alternatively connected to the central office, in accordance with the position of the switch :

Block 5 or Watermael;
Block 9 or Groenendael;
Block 13 or Genval;
Block 19 or Mont-Saint-Guibert;
Block 21 or Chastre;
Block 28*bis* or Rhisnes;
Block 35*bis* or Naninne;
Block 37 or Courrière.

The rule is, that the signalman only takes over the station-master's duties as regards reporting to the « dispatcher » during the hours when the station is closed.

As regards the following subsidiary offices, the central office has no means whereby the « dispatcher » can include these in the circuit :

Block 7; Rixensart; Profondsart; Blanmont; Ernage; Lonzée; Beuzet; block 29; Dave-Etat; block 36.

However, these offices, like the others, have special telephones which allow them when they desire to cut into the circuit and speak to the « dispatcher ».

Each office along the line has two telephones, one for each direction of running. The instrument marked : « to Ciney » is used for exchanging communications regarding trains running in the direction from Brussels to Ciney; while the telephone marked « to Brussels » is used for exchanging communications regarding trains running in the direction from Ciney to Brussels. This distinction in the use of the two instruments must be rigorously observed, as a separate « dispatcher » is in charge of the running in either direction.

Each instrument is fitted with an indicator so that the operator at a station along the line can at once see which instrument he has to answer.

Moreover, the indicator shows the operator when coming into the office that the « dispatcher » has called him up.

The subsidiary offices mentioned above have only one telephone, but they can cut into either of the circuits by means of a switch.

c) Division of the line into sections in connection with the « dispatching system ».

Diagram (fig. 15) shows how the line worked under the new system has been divided up into sections.

On the Belgian State Railways, the length of the sections has not been based on the working limits of the telephone apparatus, but this has generally been fixed in accordance with the length of line which can be effectively handled by the « dispatcher », whose task is very arduous on account of the density of traffic, the number of stations (on the average one every 3 km. or 1.8 miles), and the large number of matters with which he has to deal.

What is the maximum amount which can be effectively handled by one « dispatcher »?

In order to answer this question and to determine the amount of work to be

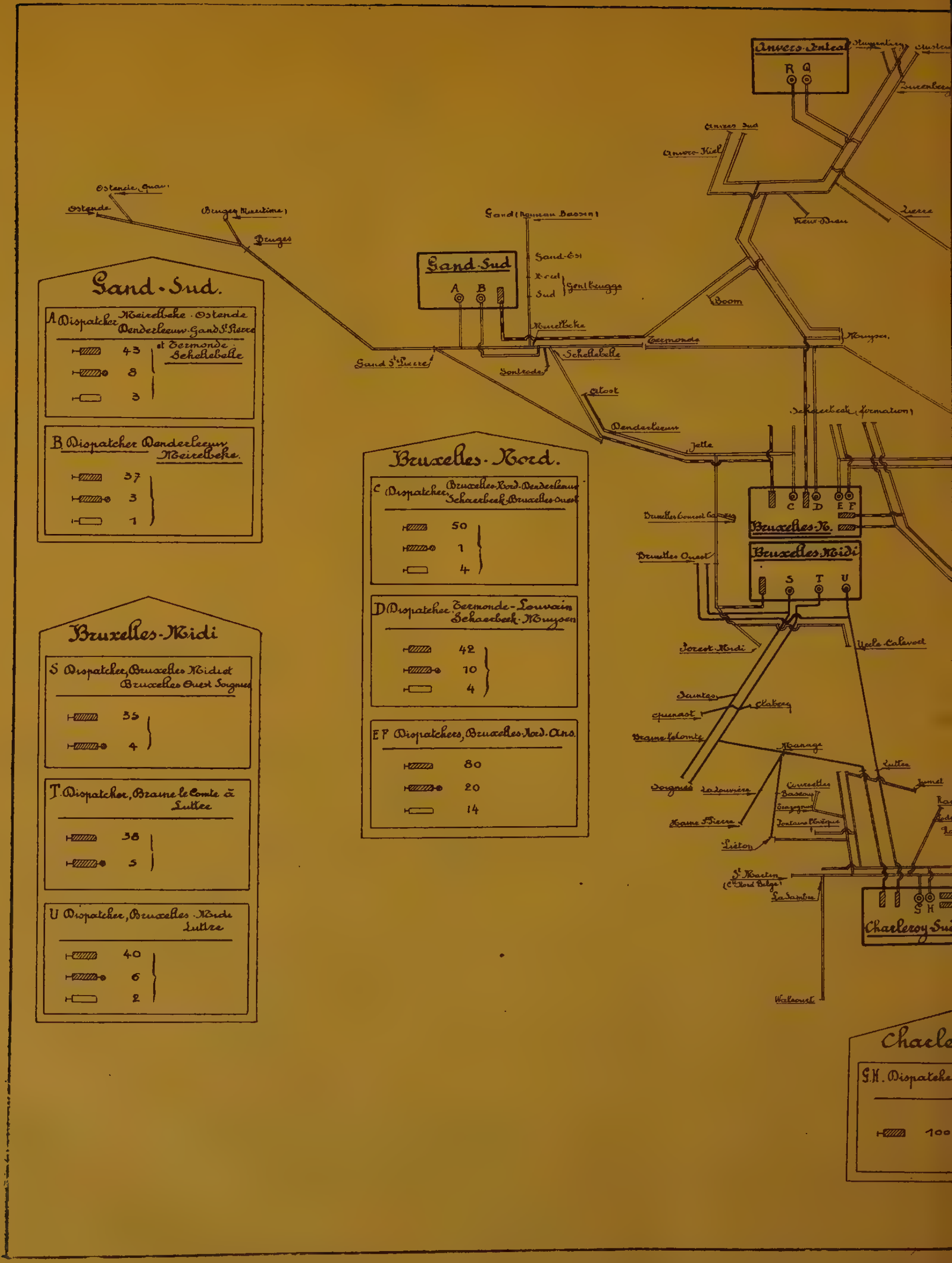


Fig. 15. — Diagram showing how the lines worked under the « dispatching system » a

EXPLANA

◎ Central « dispatching » instrument.

▨ Selector instrument.

▨◎ Selector instrument with switch to block.

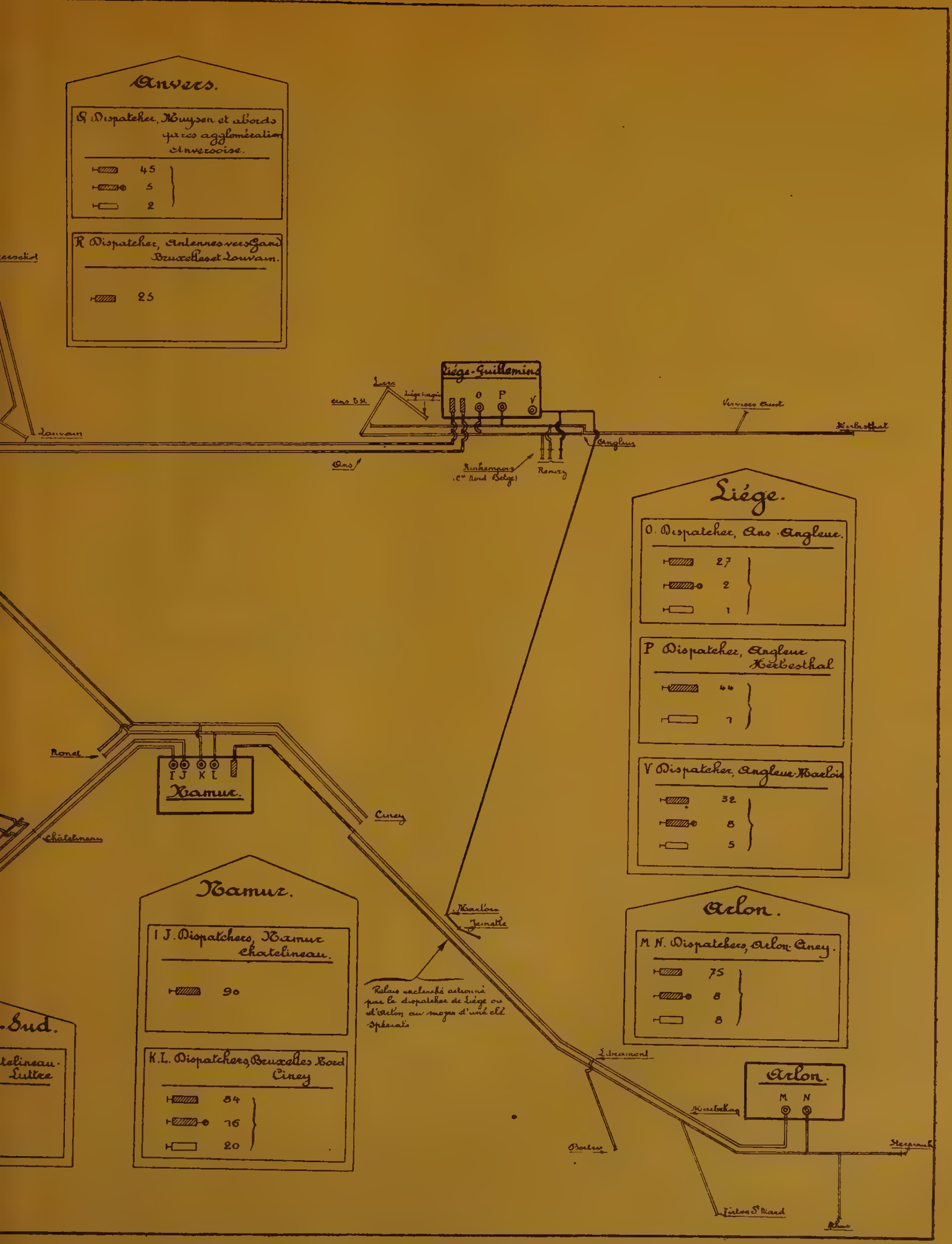
▭ Telephone apparatus for offices without selector.

Branch line connecting some of the central « dispatching » offices.

The letters A, B, C, etc., indicate th

Existing « dispatching
have been decided up

Proposed « dispatching


Anvers.
Q Dispatcher, Huysen et abords yares agglomération Anversoise.
45
5
2
R Dispatcher, Antennes vers Gand Bruxelles et Louvain.
25
Louvain
Liége-Guillemins
O P V
Lexx
Ans B.H.
Liége Longdoz
Ans
Kinkempois (Cie Nord Belge)
Renory
Angleur
Verviers Ouest
Herbesthal
Liége.
O. Dispatcher, Ans Angleur.
27
2
1
P Dispatcher, Angleur Herbesthal
44
7
V Dispatcher, Angleur-Marloie
32
8
5
Ronet
I J K L
Namur.
Ciney
Châtelineau
Namur.
I J. Dispatchers, Namur Chatelineau.
90
K.L. Dispatchers, Bruxelles Nord Ciney
84
16
20
Sud.
Chatelineau. Luttre
Marloie
Jemelle
Relais enclenché actionné par le dispatcher de Liége ou d'Arlon au moyen d'une clé spéciale
Libramont
Bertrix
Arlon.
M N. Dispatchers, Arlon-Ciney.
75
8
8
Arlon.
M N
Kleinbettingen
Sterpenich
Virton St Mard
Athus

divided into sections and how connection between the central offices is provided for.

Y NOTE.

ious « dispatchers ».

phone circuits or circuits which

ephone circuits.

Extension of an existing « dispatching » circuit so as to establish connection between « dispatchers » at different offices.

Proposed extension of the « dispatching » circuit so as to establish connection between « dispatchers » at different offices.

allotted to a « dispatcher », one must consider the following points :

a) the number of telephone messages from the various offices;

b) the number of advices of late running, alterations or special arrangements given on the telephone by the « dispatcher »;

c) the number of instructions given by the « dispatcher » for the efficient utilisation of trains and motive power, to obtain the best use of empty stock and to reduce the cost of motive power and the necessity for special trains.

For this reason the division of the line into sections has to be specially considered in each particular case, taking into account the number of trains, the number of offices to be included in the telephone circuit and traffic conditions on the line. These conditions depend especially on the variation in the speeds of various trains, the number of points at which engines are changed and the frequency of fluctuations in the traffic, because it is the latter which cause the running of special trains.

Experience shows that the limits of the capabilities of a « dispatcher » is reached on the section Angleur to Herbesthal where, according to statistics, 2 510 messages (1) are exchanged in 24 hours over the « dispatching » circuit.

On the line from Brussels to Ans, the number of messages to be exchanged with normal working is 4 900 (1) (207 per hour and intermittantly at the rate of 4 per minute), and it is not possible to deal with the whole of this line by means of one « dispatcher », or to pass all these messages over one circuit.

For this reason the telephone circuit is doubled, and each circuit deals only

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(1) *Statement of messages exchanged on some of the « dispatching » circuits.*

—	*Angleur to Herbesthal section.*	*Brussels to Ans section.*	*Brussels to Ciney section.*	*Ciney to Arlon section.*
Number of trains (in both directions of running).	130	160	147	140
Number of messages sent out from the offices relating to the passing of trains and engines.	1 270	2 150	2 120	1 900
Number of messages sent out by the « dispatcher » to ensure regularity of running (crossings, putting into sidings, etc.).	540	1 600	1 570	1 410
Number of messages sent out by the « dispatcher » which are dealt with by telegraph, (late running, alterations in working, timings for special trains, etc.).	500	760	750	810
Number of conversations between the « dispatcher » and the stations and running sheds in connection with the provision of motive power	150	260	250	410
Number of messages in connection with the distribution of rolling stock	50	200	210	300
Total number of messages exchanged over the circuit.	2 510	4 970	4 900	4 830

with one direction of running so as to avoid the necessity of splitting up the section from Brussels to Ans, which would have been detrimental to the regulation of the traffic and to the efficient utilisation of the freight engines, whose complete trip generally extends from Brussels to Ans. This division into two circuits makes it necessary for the « dispatchers » (although it must be understood that they are in the same office) to interchange between themselves a large number of messages which would take up a large part of their time (notes with regard to timings of trains, with the loading and composition of trains, as regards motive power and train crews, or operations to be carried out in the various stations, etc.).

However, to use one circuit for each direction of running and to employ two « dispatchers » for one section, it is necessary that each direction of running should possess its own siding accommodation so as to avoid too frequent crossing of the other line and consequently too many messages to interchange between the two « dispatchers ». However, in exceptional cases where trains are put into a siding and have to cross the other line, the « dispatchers » can easily work in conjunction, since they are working opposite each other (1).

d) Co-ordination of the work on a line divided into sections or on neighbouring lines which interconnect.

When by reason of the length of a line it is necessary to operate the « dispatching system » from a number of points, it is necessary to have special means whereby the control influenced by the « dispatchers » is not relaxed or altered at the points where the various sections join up.

If this liaison between the « dispatchers » in charge of the adjoining sections is not maintained, the railway rapidly loses its efficiency and contradictory orders may frequently be a source of confusion. In their mutual dealings, the « dispatchers » of neighbouring sections should not merely consider the interests of their own particular section, but the general interests of the system at large.

If a section towards which trains are running is in danger of becoming congested, the « dispatcher » on the preceding section should not wait till his colleague asks for his assistance. He should not let the trains pass the last available siding accommodation until he has found out on his own account that the trains which he is sending on can be dealt with further along the line. This it must be understood is on the assumption that the section which is congested has not already asked for assistance, as such aid can under no circumstances be refused.

These principles are implicitly stated in special instructions, which lay down the conditions under which the « dispatchers » of two consecutive sections should interchange information or advices from one section to another. It is specially mentioned that :

1° The « dispatchers » should communicate to each other (either on their own initiative, or when asked to do so), all the information which stations are required to furnish as regards train running on the several lines or sections of line operated under the system which connect with each other;

---

(1) We refer readers who require more complete information on the relative advantages of the one circuit or 2 circuit systems to an article by Mr. Lamalle, Chief Engineer, Director of Administration, in the *Bulletin of the International Railway Congress Association*, November 1922 number, p. 1355.

2° They are to keep in continual touch with each other in order to assure the regular interchange of their trains, to take the necessary steps to assist the traffic on a line which is congested, and to give orders to cancel, hold back or send by another route trains which are liable to congest the line.

Especially should they act in perfect unison when it is a question of regulating the flow of traffic at the approach to important junctions (1). A case which has particularly to be avoided under these circumstances and which may be avoided by careful regulation, is that of a train occupying a main line which cannot be accepted on the branch over it has to proceed, and which thereby completely holds up the traffic to the other branches (2);

3° They should inform one another when regular trains or special trains are delayed by engine failures and also of special trains which it is intended shall be run.

In order to assist in the working of these trains, they give timely notification to all those concerned in their operation (available light engines and spare train crews, available accommodation on regular of conditional trains) and they work together in suggesting to the running sheds the most suitable methods of working the traffic;

4° They work together in finding suitable loading for engines returning to the shed.

On the Belgian State Railways, for a series of sections on the same line, connection between two sections is carried out in a central office, the telephone circuit being extended if it is necessary. The « dispatcher », whose telephone circuit is in connection with the adjacent central office, can in this way call up his colleague on the telephone by means of the selector apparatus, and conversely the « dispatcher » at the central office which is on the circuit can cut into the circuit if he wishes and get into touch with the neighbouring « dispatcher » (fig. 17).

When the sections meet at the same point, or when there is a section of line common to both, it is necessary to place the « dispatchers » at the same table so

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(1) This is the case at the junction at Laeken (on the West suburban line of Brussels) and at Angleur (on the line from Ans to Angleur) near which 400 to 420 trains pass per day. The main lines are continually used by the trains from the converging branch lines, for which at each junction two « dispatchers » are in charge. These officials are located at the same table sitting opposite one another, in order to facilitate the mutual working in operating these busy sections.

(2) The following examples of traffic incidents which happened under the old system at the approaches to Laeken Junction (fig. 16), show what a field there is for the efforts of the « dispatcher »:

— a train coming from Brussels-Quartier-Léopold towards Schaerbeek proceeds as far as Josaphat Junction, although the Josaphat Junction section is not clear, and this results in holding up the traffic on the line from Luxemburg to North Brussels and Laeken;

— a train coming from Laeken to Brussels-Tour-et-Taxis is brought to rest at Pannenhuys Junction, and thereby holds up traffic towards Cureghem Junction;

— a train for Schaerbeek (marshalling siding) has been accepted as far as Maelbeek Junction, although it is not possible for it to enter the station, this results in holding up trains proceeding by Schaerbeek (passenger station) towards Louvain and Antwerp;

— a train from Schaerbeek to Denderleeuw proceeds as far as the junction at the Senne bridge, but has to stop there to allow more important trains from North Brussels to Denderleeuw and Termonde to pass. It would, however, have been possible to accept trains from Schaerbeek proceeding towards Pannenhuys Junction.

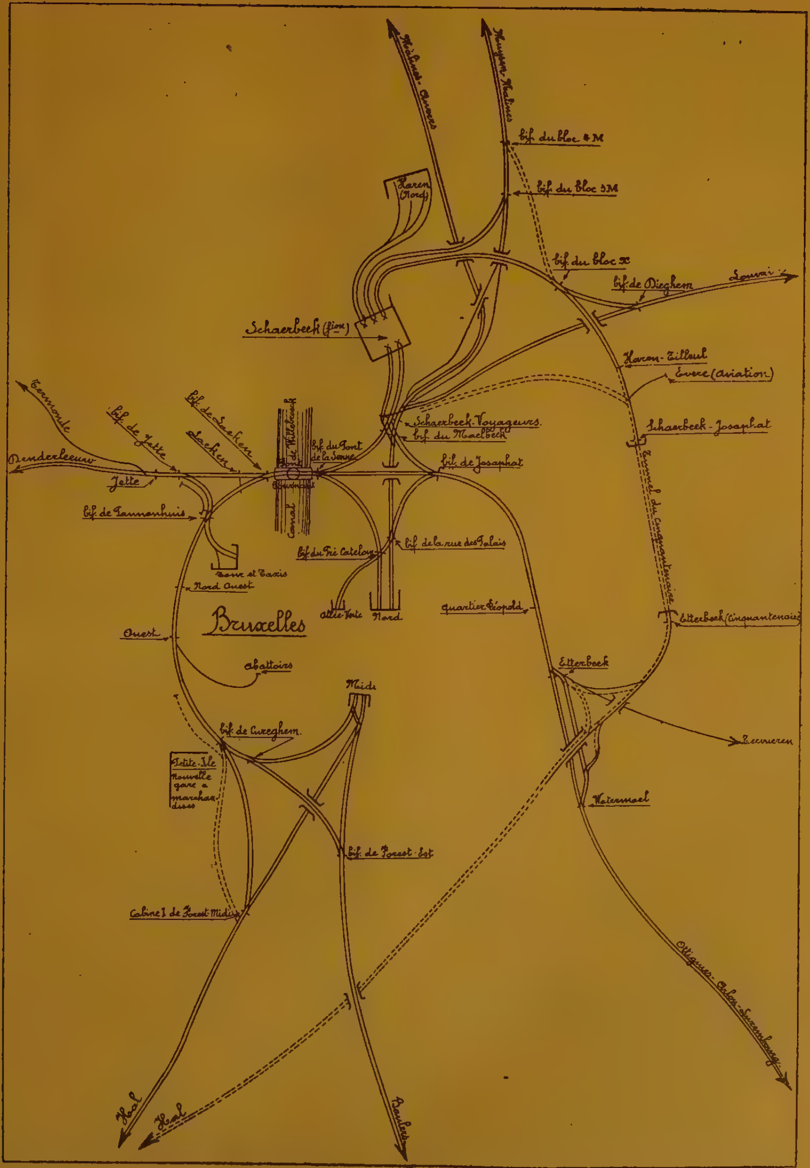

Fig. 16. — Lines approaching Laeken Junction.

Explanatory note :
- ═══ Double lines } open for traffic.
- ─── Single lines } open for traffic.
- ═ ═ ═ Lines under construction.

that their co-operation in matters which they are both concerned may be easy and complete. This concentration is also to be recommended in the interests of economy, as it allows the cost of the staff and also of the installation to be reduced.

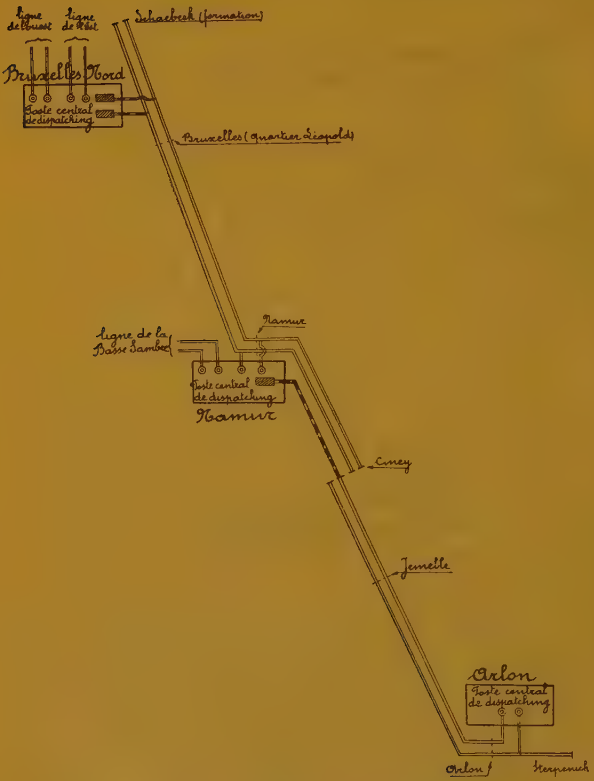

Fig. 17. — Example of the communication between central offices.

EXPLANATORY NOTE :

● Central « dispatching » instrument.
▨ Selector instrument.
— Extension of the « dispatching » circuit so as to establish connection between two central offices.

Diagram (fig. 15) gives some details as to the way in which communication between the central « dispatching » offices is established.

e) Choice of location of the « dispatching » office.

Although when merely considered from the point of view of the regulation of traffic, the location of the central office is a matter of indifference, experience shows that on the Belgian State Railways there are practical reasons for installing the « dispatcher » in the chief office of the traffic department.

By this means the following advantages are obtained :

1° the direct supervision of traffic movements by the responsible chief of the department;

2° assistance of the « dispatcher » in the distribution of rolling stock so that this distribution of rolling stock may be carried out in accordance with the train service;

3° the « dispatcher » may keep in touch with the train office as regards any irregularities which the diagram of the actual running times may demonstrate, and as regards any alterations which may require to be made in the time tables in order to facilitate the work of the stations, or to make use of periods when the traffic is least dense;

4° better discipline is maintained among the executives, as the « dispatcher » has the benefit of the prestige and authority of the head of the department.

f) Modifications to be made in the traffic rules on lines on which the « dispatching system » is in vogue.

In order to give the « dispatcher » the greatest amount of liberty and to get the best results from his initiative, certain modifications which facilitate the working of the trains have been made in the working regulations.

Before the « dispatching system » was put into operation, one was not allowed, on a double line railway, to dispatch a goods train before its booked departure time, or to send it forward in the timings of a train which was running late.

At the present time these rules are cancelled on the lines under which the new system is in operation, and the « dispatcher » can send on a goods train as soon as it is ready without waiting for its booked departure time.

In this way one can very often avoid the effect which the late running of passenger trains may have on the running of goods trains, by running the latter as far as possible beyond the place where they normally are put into the siding. However paradoxical it may appear, the late running of a passenger train, which automatically affects to a greater and greater extent a whole series of goods trains, may often, under the new system, lead to a saving of time in the case of the latter.

The « dispatcher » also is at liberty to cancel the stops shown in the timetables if they are not necessary, and to reduce the standing time at stations in cases where he arranges for the necessary work to be done by another train which has more time to spare, or to arrange for an additional stop at a station where there is abnormal traffic to be handled, which he is able to do by running the train in advance of its booked time.

It is only with the « dispatching system » that the special arrangements mentioned above can be allowed, as the « dispatcher », by means of his diagram, can accurately determine the sidings which are clear, and can make special arrangements for trains to be put into a siding where necessary, and by means of the rapid methods of obtaining information, can ascertain the possibility of the trains being received at the stations to which they are destined, or to find at what stations a stop may be cancelled or at which stations an additional stop is required, and to make the necessary arrangements for the same.

The additional safeguards obtained by means of the « dispatcher » have also allowed the « dispatching » telephone to be substituted for the telegraph for the rapid transmission of the majority of messages dealing with the running of trains and the distribution of rolling stock. At the present time advices of late running or of alterations in normal order of the running of trains are sent by telephone to the stations concerned by the « dispatcher ». In addition to greater rapidity, these advices have the merit of being absolutely accurate, because the one giving the information is in continual touch with the facts. Previously these messages were sent out by circular telegrams which were often distributed too slowly for them to fulfil the purposes intended.

Moreover, it is the « dispatcher » who sends to the stations and running sheds concerned, in place of the telegraph being used, information dealing with the cancellation of regular trains and the running of additional or special trains. For the running of special trains in particular, the « dispatcher » himself arranges their timings and route, and this results in their being run in the easiest way, and stations and running sheds are warned of what is occurring a long time in advance of the actual arrival time of these trains, and this results in a considerable advantage accruing in arranging for motive power at the stations where engines are changed, and in reducing the standing time at these stations.

g) The Liége inclines.

In order to maintain a constant loading between Brussels and Herbesthal, banking engines are provided for the gradients between Liége and Ans, 4 516 m. (2.8 miles) long (fig. 18).

This section of the line, which at places is as steep as 1 in 32, is an important factor in the operation of the line from Brussels to Herbesthal in consequence of the large number of fast trains and the considerable fluctuation in the goods traffic. Special trains have often to be run, and continual supervision is necessary in order to regulate the traffic, having regard for the changes which have to be made in the movements of banking engines between the two ends of the incline.

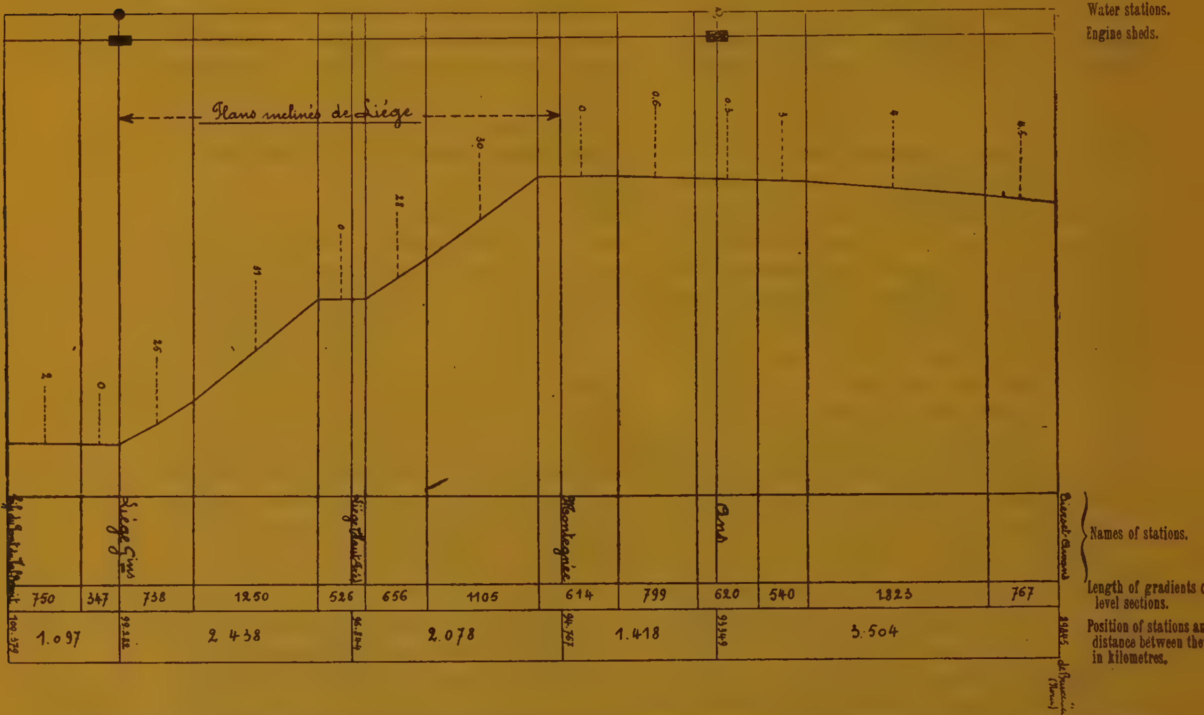

Fig. 18. — Gradient profile of the section from Bierset-Awans to the junction at Val-Benoit bridge.

The motive power department, which naturally is concerned in providing these banking engines without delay and at the same time making efficient use of the same, considers that it is only by means of the « dispatching system » that these conditions can satisfactorily be met.

The « dispatcher », by means of information which he gets in advance, knows at once the position, the loading and the conditions as regards motive power and brake power of the trains which have to pass over the incline, and he can therefore advise the banking engines beforehand in such a way as to reduce to a minimum useless standing time, and to facilitate the arrangements of the working of the banking engines by indicating in which order they should be used in the interests of the traffic as a whole.

At the present time therefore, it is the « dispatcher » who is in sole charge as regards the utilisation and running of the banking engines and also the organisation of the brakesmen who work the brakes of trains descending the incline.

Standing orders (appendices 1 and 2) lay down the rules to be observed by the train crews employed in working the incline, and also by the « dispatcher ».

It may be stated that after a year's experience these arrangements have very appreciably improved the running of the trains, and reduced (as we shall see in chapter IV : « Financial results»), the expenses as regards motive power and staff employed in working the incline.

h) Records kept by the « dispatcher ».

As we have seen in article 10, paragraph *a* of chapter II : « Principles with which the « dispatchers » have to conform », and also notes (¹) and (²) of the same article, the « dispatcher » draws a diagram of the running of trains on squared paper to a scale larger or smaller in accordance with the density of traffic.

On this diagram, passenger trains are represented by black lines, goods trains by blue lines, and light engines by a black or blue dotted line, according as to whether the engines are for passenger trains or for goods trains. When there are four lines, trains or light engines running on the relief lines are shown as red lines or red dotted lines. The representation of trains running on two lines which converge are shown by means of lines of different colours or type so that it can be seen that these trains meet at the junction.

Practical experience shows that the above method allows the whole of the train movements to be easily followed and that all the necessary information can be obtained.

The « dispatcher » attachs to his diagram a statement of any irregularities which he notes, and the head-quarters train office is instructed to take suitable action.

⁂

In each central office is kept, in addition, a journal (table 2) in which are recorded orders, reports, circulars, messages or telegrams dealing with the running of conditional or special trains. The « chief-dispatcher », by means of this journal, issues detailed instructions as regards traffic operation.

Before finishing his shift, the « dispatcher » makes a report of any special occurrences which have happened during the time he has been in charge of the line. This report gives in the second column the reasons why any of the instructions of the « chief-dispatcher » may not have been completely carried out. It also gives :

1° In the first column :

a) the number, nature of the load, weight of load and destination of wagons which are standing at the stations and those which are to be given priority of dispatch;

b) the number, loading and destination of the wagons which are to be sent away in the ordinary course which the

TABLE 2. — Specimen of journal kept at the central office.

DATE ....

INSTRUCTIONS of the « chief-dispatcher » and of the « dispatcher » stating the operations to be carried out and the special measures and precautions to be taken during the day. (Articles 426 and 427 of R. G. E. — 1st part, section III).	REPORT (by the « dispatcher » in charge) on the daily progress and in the execution of the said instructions : (Article 428 of R. G. E. — 1st part, section III).
....	....
« Chief-dispatcher »	

TABLE 2. — Specimen of journal kept at the central office (*continued*).

WEATHER CONDITIONS ....

SPECIAL TRAINS DISPATCHED.

Number of form.	Time		Origin.	Destination.
	Departure.	Arrival.		
....	....	....	....	....
....	....	....	....	....
....	....	....	....	....
....	....	....	....	....
....	....	....	....	....
....	....	....	....	....
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REMARKS

....
....
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....
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....
....

« Dispatchers » in charge during the day,

Seen by the undersigned « dispatcher » during the night,

Remarks by the « chief-dispatcher » on the above report and action taken in consequence of the statements made in the report.

....
....
....
....
....
....
....

« Chief-dispatcher »,

stations along the line have not been able to dispatch;

c) regular or special trains (number of wagons, nature of load, and destination) which have to run over the line;

d) engines and footplate staff which are lodging out, giving the place where they lodge out and the time at which they will be again available;

e) engine working arrangements agreed to by the running sheds which have not yet been put into operation, and also those which have been suggested to the motive power department and which have not yet been agreed to by them;

f) any incidents or special events which it may be well to make note of: derailments, siding accommodation which for the time being is not available, failure of water supply, failure of turntables;

g) late running, cancellation or alterations in train arrangements.

2° The second column gives clear and concise information as regards the steps taken by the « dispatcher » to preserve or regain regularity in the train movements and in order to effect economies (advantageous motive power arrangements, trains which have made up for lost time through action on the part of the « dispatcher », cancellation of special trains whose loads have been able to be handled by the ordinary trains, utilisation of engine power on the return trip, exchange of engines of two special trains, etc.).

3° The third column gives information dealing with special freight trains which have run over the line.

4° The fourth column gives modifications or different arrangements proposed to improve the service of the line or the inner working of the office.

Change over of duty between the two « dispatchers » is recorded at the foot of these remarks by the words « Seen when taking over duty at ... hours ».

The in-coming « dispatcher ».	*The out-going « dispatcher ».*
(Signature.)	(Signature.)

* * *

The « dispatcher » makes out a form on stiff paper (table 3) for each special train; this form gives, independently of the information sent in by the stations, the actual mileage run by the various engines and train crews used in working this special train. The utilisation of engines and train crews on the return journey is given on the back of the said form, as well as any incidents which may have occurred on route (delay through lack of relief, cancellation, etc.).

* * *

Reports of late running, alteration in the order of trains and of cancellation of trains sent out to stations and running sheds are entered by the « dispatcher » on a special form (table 4). The same applies to instructions given by the « dispatcher » over the execution of which he has no immediate control.

Any communications which proceed from the office of the director of the service or which are addressed to him and are sent through the « dispatcher », are reproduced on a telephone message form (table 5).

Table 3. — (Front of page.)

No. ....

from ....

to .... hours.

DISPATCHING SYSTEM.

Report form for special trains

Special trains .... from .... to ....

DEPARTURE	booked	to	hours.
	actual	to	hours.

LOAD and composition	....
	....
	....
	....

ENGINE Nos.	Type.	Shed.	Commencement of service.	Trip	
				from	to
....	....	....	....	....	....
....	....	....	....	....	....
....	....	....	....	....	....
....	....	....	....	....	....

	NUMBER.	Shed.	Commencement of service.	Trip	
				from	to
Guards-in-charge	....	....	....	....	....
	....	....	....	....	....
	....	....	....	....	....
Brakemen	....	....	....	....	....
	....	....	....	....	....
	....	....	....	....	....
	....	....	....	....	....
	....	....	....	....	....
	....	....	....	....	....

TABLE 3. — (Back of page.)

No.	Utilisation of motive power and train crews on return journey.
ENGINES	
Brakesmen	
Guard-in-charge	

MESSAGES TO STATIONS AND REPAIR SHOPS.	REMARKS.

TABLE 4.

DISPATCHING SYSTEM.

Line from North Brussels to Ans.

Date ....

STATIONS	1	2	3	4	5	6	WORDING OF MESSAGES.
North Brussels							1
Schaerbeek (South)							
Schaerbeek (marshalling sidings)							
Dieghem							
Saventhem							2
Cortenberg							
Velthem							
Herent							
Louvain M.-N							3
Louvain P.-Q.							
Louvain (passenger station)							
Coorbeek-Loo							
Vertryck							
Tirlemont							4
Esemael							
Neerwinden							
Landen							
Gingelom							5
Rosoux							
Waremme							
Remicourt							
Fexhe-le-Haut-Clocher							6
Bierset-Awans							
Ans							
Liége (Guillemins)							
Liége « dispatching » office							

Table 5.

From : ....

No .... || ...... words.

Addressee :

....

Time limit for delivery :

....

Received or sent :

....

Sent out :

....

Delivered or readdressed :

....

ADMINISTRATION
of the
BELGIAN STATE RAILWAYS.

R. A. G. III, p. 435, ch. 4.

SERVICE TELEPHONE MESSAGE.

Office ....

Handed in at ...., No. ....

Received at .... at.......... h. .... m.

CHAPTER III.

Choice of the staff.

The « dispatching system », as described, on the Belgian State Railways, has only been able to be put into operation by means of the assistant station-masters of the large goods stations, who were qualified as much by their personality and standing, as by their technical knowledge.

The staff of a central office which has two telephone circuits to attend to (the two directions of running in the case of the line equipped with a double circuit or two lines equipped with a single circuit) consists of a « chief-dispatcher » in charge of the work and ten « dispatchers ». Their hours of duty are regulated by means of a fixed roster (fig. 19). It is necessary to reduce the time off if some of the « dispatchers » are ill or are on holiday.

« Dispatchers » take six hours at the telephone receiver in two periods during an eight hour working day. During the night at offices where the work becomes slacker at certain times, a switch allows two circuits to be connected to the same receiver, and two « dispatchers » may in this way communicate with each other without the intervention of a third.

It has appeared essential that the « dispatcher's » staff should be sufficient to allow each member to have on the average two visits per month to the stations, and it is only in this way that they can keep in touch with the difficulties of the out door staff.

These visits should include:

1° A study of the lay-out (arrangement and utilisation of the various lines, groups, sidings, junctions, various installations and signals);

2° A study of the traffic dealt with by the station (local and through traffic; origin, destination and importance of the traffic).

Although the uninterrupted movement in the large stations always affords the « dispatcher » with objects for his observation, he should not neglect the stations of secondary or even of little importance, and he can choose the best time for his visit.

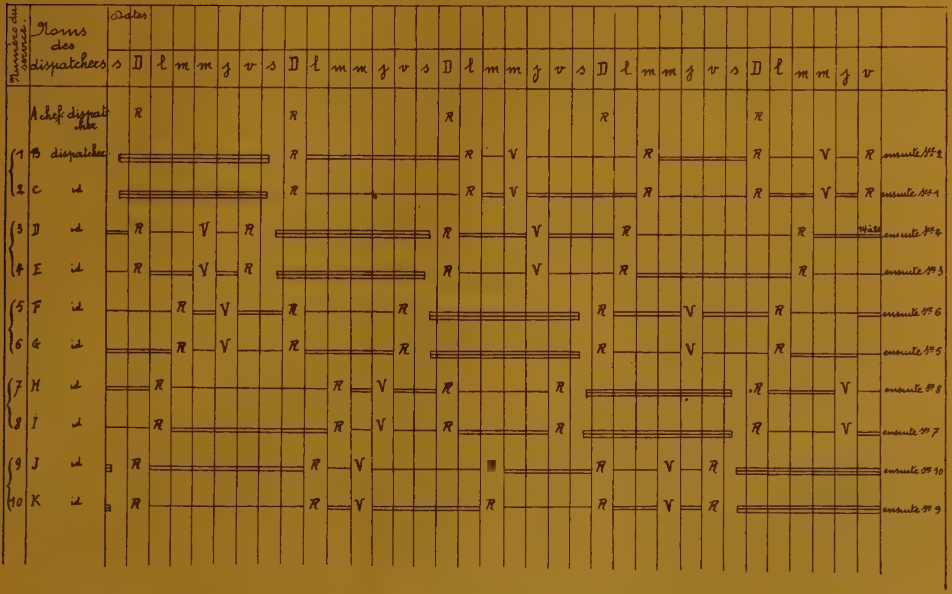
Numéros du service
Noms des dispatchers
Dates
s D l m m j v s D l m m j v s D l m m j v s D l m m j v s D l m m j v
A chef dispatcher
1 B dispatcher
2 C id
3 D id
4 E id
5 F id
6 G id
7 H id
8 I id
9 J id
10 K id
R
V
ensuite N° 2
ensuite N° 1
ensuite N° 4
ensuite N° 3
ensuite N° 6
ensuite N° 5
ensuite N° 8
ensuite N° 7
ensuite N° 10
ensuite N° 9

Fig. 19. — Table of the hours on duty of the staff at the central office on the line North Brussels to Ans (two « dispatchers » operating two different circuits).

EXPLANATORY NOTE:		Sundays and holidays.
———	: 6 to 14 h.	8 to 14 h.
═══	: 14 to 22 h.	14 to 22 h.
≡≡≡	: 22 to 6 h.	22 to 8 h. (Saturday night to Sunday or holiday).

R = Rest. — V = Visit over the line.

For this reason, for example, this visit should be made at the time when shunting is being carried out at the station or when traffic tends to become relatively congested. In this way it is possible for the « dispatcher » to observe any special features in the shunting operations and to become acquainted with the possibilities afforded by the lay-out. Having found out on the ground what information the stations are particularly interested in receiving, the « dispatcher » when he is back again at his instrument has a greater influence and authority and does not run the risk of asking the stations to do impossibilities.

M. Lamalle, in his article on the subject, very aptly states that it is the « dispatchers » who make or mar the « dispatching system » : the value of the system depends on the value of the « dispatchers ».

This view is by no means exaggerated. In order that the visits to the stations may be of practical use, and in order that the « dispatchers » may have the necessary standing, it is necessary in the first place that they should inspire in those who have to carry out their instructions, esteem for their efficiency and respect for their experience. It is necessary that the station staffs should feel and recognise that the measures recommended or the instructions given are sound, and if sometimes they are asked to make a special effort, that this will always lead to appreciable results.

It is necessary in fact that those working under the system should have complete confidence in the « dispatchers ».

Unfortunately, officials who can give this impression are very rare, especially as the training of the whole staff was interfered with by the war, and it was necessary to choose the staff somewhat hurriedly in order to put into force the eight-hour day and to make up for the gaps left by retirements which had been postponed during the war; and since it was hardly advisable to take any of the staff from the large stations, as these already were short of capable staff for carrying out their ordinary work, it became obvious that the Belgian State would have to carry out its programme as regards the « dispatching system » with the smallest number of highly trained staff.

This limitation in the number of highly trained officials available obviously made it the more necessary to work the system under the direction of an efficient and energetic management. For this reason, in addition to the « chief-dispatcher » it was necessary to have a « head-dispatcher » for each shift of eight hours.

This being the case, the « head-dispatchers » should be assistant stationmasters who are carefully chosen from the best of the staff at the large goods stations; they have for the two tables which deal with the two directions of running of one line, or for two lines having a common section, the entire responsibility for train movements, for the make-up and motive power of trains, and for the steps to be taken with a view to clearing lines and stations. Consequently, on each of the two telephones are operators who work under the immediate and effective control of the « head-dispatcher ». These operators only carry out routine work (keeping the diagram, various messages in connection with the running of trains and the distribution of rolling stock) and need therefore be only subordinate employees, providing that they are intelligent and speak clearly, accurately and tactfully.

⁂

The operators along the line are as a rule station staff and signalmen; at certain important stations, a special employee is provided for operating the telephone, but the expense incurred by these extensions (¹) is insignificant com-

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(¹) These extensions only require a staff of nine for the 508 km. (316 miles) of line operated under the system.

pared with the economy obtained by a reduction of the staff in the telegraph offices owing to the reduction in the number of telegraph messages (¹).

CHAPTER IV.

Financial results and conclusions.

It may be repeated that the objects of the new organisation include the following main essentials :

1° to obtain regularity in the running of trains and to reduce the overall time of freight trains;

2° to work the freight traffic with a minimum expense as regards motive power, and with this object in view, to make full use of engines returning to their shed;

3° to make full use of the accommodation afforded by the regular goods trains so as to avoid as far as possible the running of special trains, or to only run these over the shortest possible distance;

4° to relieve, during times of additional traffic, stations at which trains are made up, which often become congested by reason of their lack of accommodation, until such time as these stations may be brought up to modern requirements;

5° to substitute the « dispatching » telephone for the telegraph for the more rapid and economical transmission of messages dealing with train movements and distribution of rolling stock.

It is hardly possible to determine all the economies which can be thus effected. Railway operation depends on many factors. If one can draw attention to some of these (those resulting, for example, from the more effective use made of train engines and banking engines), there are others, on the other hand, which cannot so easily be estimated by reason of their less precise character (such, for example, as the more rapid turnover of rolling stock), or because the improvements made may not be exclusively attributed to the « dispatching system ».

However, the results obtained are sufficiently clear for the committee (²), which was appointed to investigate the financial effect of « dispatching », to draw up a rule based on the additional hours which the footplate staff (drivers and firemen) would have had to have worked, to have handled the same number of freight train-miles as were worked under the « dispatching system » if the mileage worked by each set of men in an hour had during that period been the same as it would have been before the « dispatching system » was put into operation.

It may be noted that this comparison refers in some ways to the 1st, 2nd and 3rd paragraphs given above, which state the main essentials of the « dispatching

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(¹) A committee of officials of the Telegraph and Railway Administrations has been appointed to make a report on the question of the reduction of staff when the effects of the simplification of the telegraph service have become established. The first results which have been obtained so far point to an economy of 40 telegraph operators.

(²) This committee includes officials of the Traffic Motive Power and Way and Works Departments.

system », since, in order to obtain at the same speed and in the same period a greater mileage per set of men, it is necessary to improve the regularity of the train movements and to make better use of the motive power. It may be added that the basis of comparison is furnished by the figures giving « the average number of men at work, the engine mileage and light engine mileage, and the number of hours overtime worked by the staff, and these figures are taken by the motive power department from the drivers' journals.

The accuracy of these figures and the means by which they are obtained are therefore beyond question.

We will not discuss in detail the figures which are given in comparing two periods of three months before and after the adoption of the « dispatching system » for the twelve engine sheds which exclusively provide the motive power for the goods trains on the lines directly or indirectly influenced by the new system. It may be said that comparison of the totals of these figures led to this first conclusion, that « in three months, to work a given traffic required, 293 288 less man-hours than would have been necessary before the adoption of the dispatching system ».

This result may be stated as follows : « The average speed of the trains not having been changed, then, if before the adoption of the dispatching system, it were necessary to work a man-hours in order to haul b freight train-miles, it would have been necessary, during a corresponding period under the dispatching system, to work $\frac{a \times c}{b}$ man-hours to haul c freight train-miles, assuming that the dispatching system had not been adopted. If, however, with the dispatching system it was only found necessary to work d man-hours, we should base our conclusions by comparing d with $\frac{a \times c}{b}$ ».

It may be pointed out, however, that « had the dispatching system not been brought into force, the increase in traffic which has taken place since this was adopted (the number of wagons running over the lines operated under the system during the two periods of three months before and after the inauguration of the system were in the ratio of 10 is to 13), would have increased the difficulties in the train movements, and would have made it necessary, in order to carry the traffic, to work a greater number of man-hours than $\frac{a \times c}{b}$. Without taking this factor, which we cannot determine, (although there is not doubt it is an important point) into consideration in our calculations, we arrive at too low an estimate of the economies due to the dispatching system ».

On the other hand, the following questions may be asked as regards whether there have been any particular circumstances which may have contributed to the favourable results recorded during the time the « dispatching system » has been in operation :

1° Since the « dispatching system » has been in force, have not some of the stations on the lines concerned been enlarged and the signalling arrangements been improved?

— These improvements have not been of sufficient importance on the lines operated under the « dispatching system » for their effect to have been able to counteract the delays which would have arisen from the increase in traffic.

2° Have not certain engine sheds since the adoption of the « dispatching system » had to work freight trains for longer distances than was usual before the « dispatching system » was introduced?

— Investigations which have been made on this point show, that during the period under comparison, no appreciable alterations have been made in the freight train workings. If on the other hand some exchange of freight train workings have been carried out between some of the engine sheds, these have not been very numerous and are included in the group of sheds to which the balance sheet refers, and therefore from a financial point of view produce no effect.

3° Since the adoption of the « dispatching system », has not the volume of traffic in the two directions been better balanced, and may it not be supposed that this has automatically resulted in the utilisation of certain engines on the return journey which, before the application of the « dispatching system », would have had to have returned light for lack of suitable trains?

— This is equivalent to asking if the total mileage run both with a train and light engine during a working day has varied since the « dispatching system » was applied, and if it cannot be stated that the amount by which the train mileage is increased corresponds to the reduction in the light engine mileage.

In the first place it may be noted that the lines operated under the « dispatching system » differ widely as regards their traffic, and that the increase in the output per working hour is nevertheless general, and shows itself almost immediately after the « dispatching system » has been put into force. It would therefore appear to be very improbable that the explanation suggested above will be true in the case of all the lines worked under the system.

Moreover, statistics which have been drawn up on the basis which we have already given, show that the supposition that the contrary currents of traffic have been better balanced, is not found to be the case if one examines the figures. These statistics show that the average monthly kilometres run per unit of the staff (train-miles and light engine miles) has been 859 (534 miles) with the « dispatching system », as against 698 (434 miles) without the « dispatching system », that is to say, an increase of 23 %. If one considers only the kilometres run with a train, the ratio is as 791 to 633 (491 to 393 miles), that is an increase of 25 %.

It will also be seen from these figures that, under the « dispatching system », out of the 859 km. (534 miles) run per month per unit of staff, there were 68 (42 miles) light engine kilometres, that is to say, 7.91 %, while before the adoption of the « dispatching system » there were 64 (40 miles) light engine kilometres run out of a total of 698 km. (434 miles), that is 9.17 %.

The proportion of light engine running has thus undergone a slight reduction (1.26 %); but on the basis of the actual results explained in the second part of this chapter (dealing with reduction in the number of banking engines necessary on the Liége inclines and the more intensive use of motive power required for special trains), we are led to say that this reduction of 1.26 % is due, not to a better balance between the currents of traffic in the two directions, but to the co-ordination obtained by the « dispatching system » with a view to improving the utilisation of the engines, and that this has been done despite the increased difficulties of the service.

In conclusion, it is no exaggeration to attribute wholly to the effect of the « dispatching system » the gain of 293 288 train-crew-hours during the course of three months.

Let us consider the resultant economy:

a) On the basis of one year, this gain to equal to 293 288 × 4 = 1 173 152 train-crew-hours.

If we suppose that the hours worked by drivers and firemen are approximately the same as those of the chief-guard and brakesmen, and that there is one chief-guard and on an average two brakesmen per freight train, we have the following figures :

Average pay per hour	footplate staff (driver and fireman) . . . . fr.	4.48 (1)
	chief-guard	2.77 (1)
	two brakesmen (1.65×2) . .	3.30 (1)
Total per hour for train crew . . . . fr.		10.55

That is to say, an annual economy as far as wages are concerned of 10 fr. 55 × 1 173 152 = 12 376 753 fr. 60.

b) To each hour of the driver's time there is at least a corresponding hour of the engine standing in steam, that is to say, an average expense of 2 fr. (30 kgr. of coal at 65 fr. per tonne, in addition to lubricating oil). This gives us, as regards value, an annual economy of 2 × 1 173 152 = 2 346 304 fr.

* * *

Among the twelve engine sheds whose results have been considered by the Committee, the Liége shed has not been included because this mainly deals with the working of passenger trains, but it also is concerned with the banking engines on the Liége inclines (see paragraph 9, chapter II, entitled : « Liége inclines »). We have therefore drawn up a special account of the economies realised in this respect since the adoption of the « dispatching system ». The information which we can give on this matter is particularly interesting.

We have seen that the « dispatcher » has to decide upon the utilisation and movements of these banking engines, and that he has at his disposal reliable and rapid means of obtaining the information which allows him to make judicious use of these locomotives so as to avoid unproductive movements and to increase their useful mileage.

In this way the « dispatching system » obtains certain economies without any external assistance. Since these results have been obtained during the period under consideration without any change having been made as regards the timings, lay-out, or methods of working, all other things are equal, and these economies must be entirely placed to the credit of the « dispatching system ».

Let us state what these economies have been :

When the « dispatching system » was brought into force, the number of banking engines required were as follows :

7 engines from 6 to 14 o'clock.
8 engines from 14 to 22 o'clock.

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(1) In the above figures for the average wages we have included allowances for lodging out and increase in the cost of living, but not the bonuses granted to the running staff. We consider that the total cost to the Administration as regards bonuses is not influenced by the « dispatching system » since they have been decided upon by legislation.

8 engines from 22 to 6 o'clock.
and one spare engine in steam at the shed during the whole 24 hours.

The above engines were hardly sufficient for the traffic demands, and there were numerous cases in 1921 and 1922 of additional banking engines being required.

Experience showed that these engines were found to be insufficient when the monthly kilometrage amounted to 29 000 (18 000 miles), and at this time it appeared absolutely necessary to provide one additional locomotive whenever the monthly kilometrage became 30 000 (18 600 miles).

Since then, this figure has been exceeded, as is shown in the following table :

Working of « T 16 » class locomotives on the Liége inclines.

MONTH.	TOTAL KILOMETRES.
December 1921	25 540
January 1922	26 121
April 1922	28 181
December 1922	30 774
January 1923	34 792
April 1923	35 901
May 1923	21 786 (strikes).
June 1923	36 779

Without the « dispatching system » this increase in the kilometres run would have called for an additional banking engine. With the « dispatching system », however, not only has it been unnecessary to have this additional engine, but by means of the new organisation it has been possible to reduce the number of engines as follows :

commencing 19 November 1922, one banking engine from 14 to 22 o'clock on Sunday;

commencing 26 February 1923, one banking engine over the whole period of 24 hours;

commencing 5 May 1923, one banking engine from 22 to 6 o'clock Sunday night and Monday morning.

This reduction under the new system is equivalent to *1 272 hours* per week, *i. e.*; (6 + 7 + 7 engines) × 8 hours × 6 days + 1 spare engine × 24 hours × 7 days + (6 + 6 + 6) × 8 hours × 1 day (Sunday) — as against *1 456 hours, i. e.* : (7 + 8 + 8) × 8 × 7 + 1 × 24 × 7 — that is an annual economy of (1 456 — 1 272) × 52 weeks × 27 fr. (cost per hour of a shunting engine) = 258 336 fr.

Moreover, as the « dispatching system » has extended the possible limits of the mileage run by the banking engines taken as a whole, in spite of the reduction in their number (see the figures for April and June 1923 in the above table), there will be on this account an additional source of economy whenever the 30 000 km. (18 600 miles) are exceeded. These economies being proportional to the kilometres actually run in excess of 30 000, the amount at which, as we have already seen, an increase in the number of banking engines would have been necessary if the « dispatching system » had not been adopted.

Experience shows that the present number of banking engines would be sufficient, at any rate as long as the monthly kilometres run do not exceed 37 000 (23 000 miles); and if we accept this limit of 37 000 under the new system, we find that in addition to the continual economy dealt with above, we have a variable economy which has a maximum value equal to

$$\frac{37\ 000 - 30\ 000}{30\ 000} = 23\ \%$$

of the total running cost of the whole of the banking engines used upon the gradients.

It is obvious that we are understating the case if, as regards these variable economies, we place to the credit of the « dispatching system » for the period under consideration, half the cost of the regular use of a banking engine, that is to say, in one year, 27 × 12 (hours) × 365 = 118 260 fr.

The total economy obtained in a year as regards the banking engines on the Liége inclines can therefore be estimated as 258 336 + 118 260 = 376 596 fr.

We have seen above that the « dispatching system » may reasonably be credited with a reduction of 36 % (13 + 23) of the total cost of the banking engines on these gradients. This statements is indicative of the economic possibilities as regards the cost of motive power for special trains on any lines worked under the « dispatching system », because the engines of these trains, as in the case of banking engines, do not run to any booked working, and can only be judiciously and economically used by means of the co-ordination obtained by the « dispatching system ».

We give (fig. 20) an example of actual engine workings by means of which engines and train crews of special trains only work these as far as is necessary, and in every case where there is an available load, are utilised on the return journey.

Appendix No. 3 gives the difference between the economy realised and the expense incurred, and broadly indicates the annual financial balance sheet of the « dispatching system ».

We extract below the more important figures :

First cost of establishment : fr. 3 760 060.29 including an annual charge (at the rate of 10 °/o for interest and sinking fund) . . . . fr.	376 006.03
Annual expenditure incurred by the Way & Works Department (maintenance, repairs, etc.)	44 000.00
Annual expenditure incurred by the Traffic Department (salaries and expenses of staff, etc.).	690 838.50
Total expenses. . . fr.	1 110 844.53
Economy in the wages and allowances of train crews. . . . . fr.	12 376 753.60
Economy in fuel, lubricants, etc. .	2 346 304.00
Economy realised in assisting trains on the Liége inclines	376 596.00
Total amound saved. . . fr.	15 099 653.60
Net saving	13 988 809.07

The total length of the lines operated under the system being 508 km. (316 miles), *the reduction in the cost of operation per kilometre of line is 27 537 fr. 02.*

* * *

We are not yet in the possession of the statistics which are being drawn up by the Telegraph Department in order to ascertain the economy which has resulted from the reduction in the telegraph staff and apparatus due to the substitution of the dispatching telephone for the telegraph in transmitting certain railway messages.

The saving mentioned above will be increased on this account, and in this connection we have already been able to form a rough estimate from the results

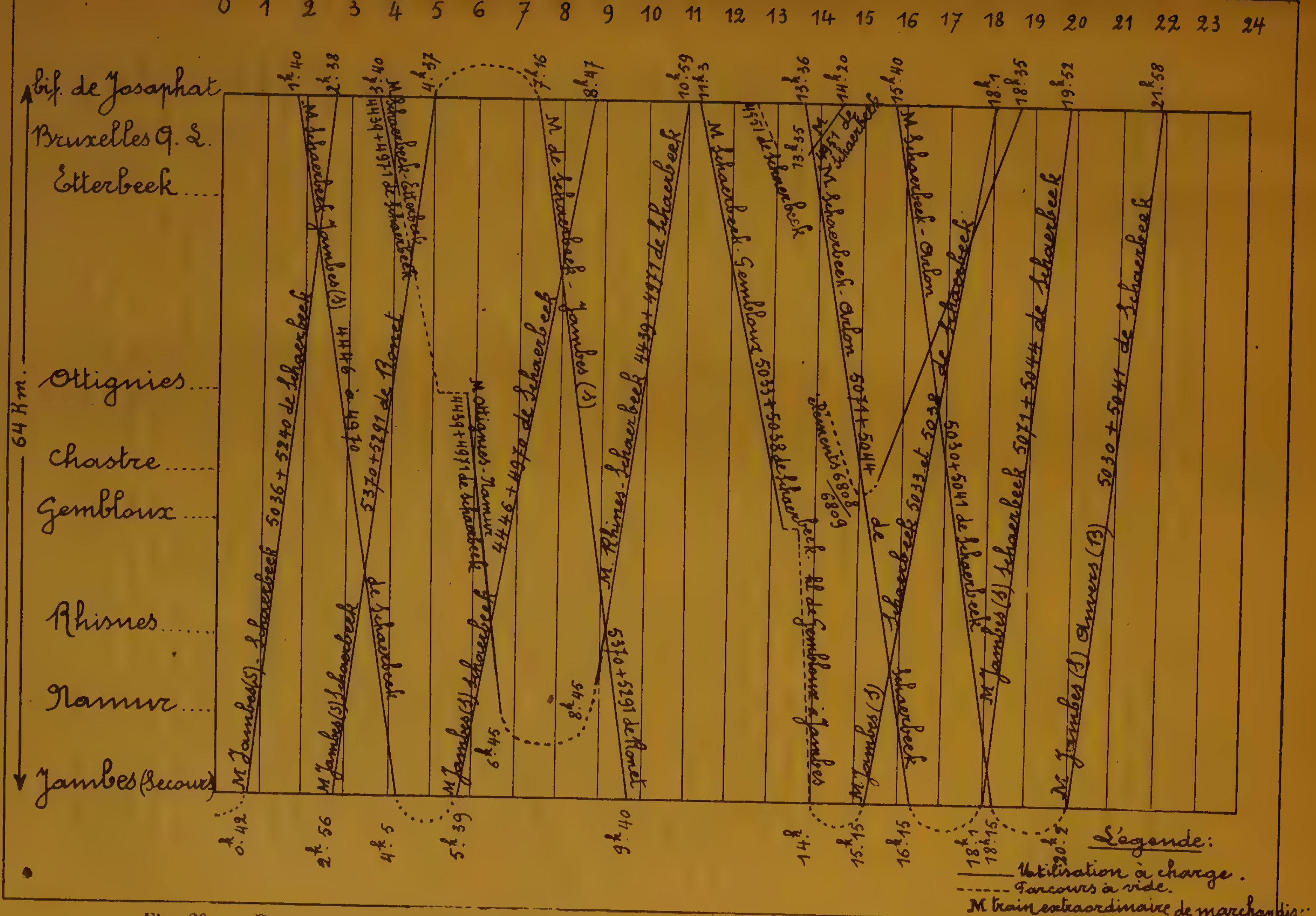


Fig. 20. — Examples of the efficient utilisation in the return journey by means of the « dispatching system », of engines which have worked special trains.

(The profile of the line is a succession of up gradients and down gradients of 1 in 63, and freight trains are, as a rule, double headed).

Explanation of French terms :

Légende = Explanatory note. — Utilisation à charge = Working train. — Parcours à vide = Light engine. — M train extraordinaire de marchandises = M special freight train, which have been obtained so far : 40 telegraphists have become unnecessary at the more important centres, and more than 200 km. (124 miles) of telegraph circuits have been handed over to the public telephone service.

Although we cannot at present draw up any general conclusions from this, it is probable however that the saving due to the reduction of the telegraph staff and equipment will offset the salaries of the staff which operate the new system (66 employees at the central offices and 9 along the line).

CONCLUSIONS.

We must not conclude this article without mentioning, that as regards an elementary form of the « dispatching system », namely, the « traffic regulation offices » which were adopted in 1914, but which the Belgian State Railways could not put into operation on account of the war, three main objections have been raised :

1° The expenses of equipping and operating these were high and did not account for a corresponding saving;

2° The « regulator » took upon himself authority which should only be assumed by the heads of the traffic department;

3° The operations of the « regulator » tended to restrain and destroy the initiative and activity of the station-masters and their assistants.

This was the feeling on the part of the staff, when in 1921 circumstances made it necessary to re-establish the « traffic regulation offices » which were planned no longer on the model of the similar Prussian pre-war organisation, but in accordance with the more flexible methods of the « dispatching system ».

The experience of two years under the « dispatching system » has shown how groundless were the fears which were experienced at the offset, and the results obtained show clearly — as an established fact — the excellence of the new system. The net takings of the railway and telegraph have shown, in 1921-1922, for 62 km. (39 miles) of line operated under the « dispatching system », an increase of 25 800 fr. per year per kilometre. In 1922-1923, for 508 km. (316 miles) equipped with the « dispatching system », the increase has amounted to 27 537 fr. per year per kilometre. Moreover, in this estimate, only the figures referring to the railway have been included.

We have therefore a result which is entirely opposite to the financial losses which were predicted as inevitable and a very eloquent confirmation of the conclusions arrived at in Mr. Lamalle's article : « The financial results have exceeded the most optimistic predictions. »

By re-adapting the « dispatching system » to the needs of the moment, and by making use of the possibilities offered by the special « selector » telephone apparatus by which communication could immediately be made with the various stations spread along the line, the new system was brought into force in 1921 at the traffic head-quarters of the division and placed under the control and responsibility of the head of the department. The second criticism therefore fell to the ground. As a result, the whole traffic on the line is controlled minute by minute and station by station. Incidents in train movements are at once noted, and one can immediately take the proper steps to meet the circumstances. The chiefs of the department, which are accurately and continually kept in touch with all the details of the service, have arranged for a better distribution of work, so that a station which at any time is insufficiently occupied may be called in to assist another station which is threatened with congestion.

This more equitable distribution of the work has naturally created a favourable feeling towards the new organisation on the part of the stations which have a heavy traffic. They took to it rather reluctantly at first, and then with greater confidence, as they found that its judicious intervention got them out of difficult situations in which they found themselves.

A similar feeling is growing in the stations which are not so hardly pushed, when they realise, as a result of the persevering efforts of the « dispatching system », that there is more to be gained for themselves and for everybody else from a well organised activity than from the stagnation or disorganised efforts which they have hitherto experienced.

Finally, when the station-masters were convinced that the « dispatching system » could always give them precise information which assisted them in their duties, and that useful advice when they were in any uncertainty could always be obtained from the new organisation, they recognised the « dispatchers » as worthy collaborators on whom they could always count for expert assistance, and a mutual esteem took the place of the distrust which existed at first.

As we have said, one cannot have a better answer to the criticisms which were raised when the system was instituted than is given by the facts themselves. Although the « dispatching system », like all other human devices, can no doubt be improved upon, the fact remains that those who state that : *a railway without the « dispatching system » is hardly conceivable,* have a correct appreciation of the power of the new organisation, both from a technical and an administrative point of view.

APPENDICES.

APPENDIX 1.

Rules in connection with the « dispatching-system » for banking engines working on the Liége inclines.

The motive power department shall provide the traffic department with the following engines to be used exclusively for banking purposes :

7 engines from 6 to 14 o'clock,
8 engines from 14 to 22 o'clock,
8 engines from 22 to 6 o'clock.

and in addition, a spare engine is to be kept at the shed during the whole 24 hours.

The utilisation and workings of these engines are to be *solely controlled by the « dispatching system »*. For this purpose, the motive power department office at the foot of the incline must furnish the « dispatcher » with all necessary information, such as : the numbers of the banking engines assisting the different trains whether ascending or descending the incline; the return of any engine to the shed for repairs; engines which are detained an abnormal time by signals outside Liége, etc.

The numbers of the engines which have gone for coal and water at Montegnée or which require minor adjustments at that place are notified by the motive power office at Montegnée to the office at the foot of the incline, which office immediately transmits this information to the « dispatcher ».

The latter informs the traffic superintendent at Montegnée, who, in conjunction with the locomotive inspector, takes the necessary steps to obtain the requisite motive power.

The locomotive inspector at Montegnée informs the « dispatcher » of the time when the engine resumes work after coaling or undergoing minor adjustments.

Ans station sends to the « dispatcher » its requirements as regards engines for trains that are descending the incline.

The « dispatcher » makes arrangements with the motive power department at the foot of the incline as regards sending engines to Ans.

When the « dispatcher » considers that it is necessary to call out the spare engine, he instructs the motive power office at the foot of the incline to requisition the same from Liége running shed.

In the ordinary way, the time required to coal a banking engine at Montegnée is 50 minutes.

In cases of urgency, in order to expedite the movements of the banking engines, the « dispatcher » may give orders for the coaling to be only partially carried out.

This order is sent to the motive power department office at the foot of the incline, who transmits it to the office at Montegnée.

In the ordinary way, the time allowed to banking engines for engine duties is 20 minutes after their return to post III.

However, this time is merely the maximum amount, and drivers are required to reduce the standing time for engine duties as far as possible.

As far as possible, the turns of duty are to be taken in rotation. However, if traffic requirements make it necessary that an engine should work out of its turn so as to avoid holding back a train, the driver is required to comply with the instruction given.

The motive power department immediately informs the « dispatcher » of changes or modifications which have to be made for any reason whatever, as regards the number or working of the banking engines.

APPENDIX 2.

Regulations in connection with the « dispatching-system » for brakesmen and chief-brakesmen on the Liége inclines.

The motive power department shall provide the traffic department with the following staff for operating the brakes on trains descending the incline :

20 brakesmen and chief-brakesmen from 6 to 14 o'clock,

25 brakesmen and chief-brakesmen from 14 to 22 o'clock,

35 brakesmen and chief-brakesmen from 22 to 6 o'clock.

The allocation of these men is to be controlled *solely* by the « dispatching system ».

For this reason, the « dispatcher » keeps in touch with the motive power office at the foot of the incline, and transmits thereto the orders to be carried out at Liége or at Ans.

The motive power office at the foot of the incline must at once carry out the orders received.

However, it should transmit to the « dispatcher » any observations necessary for the regularity of the service, and should inform him of any incident which is liable to affect this regularity.

If, on receiving an order, it is found impossible to put the same into execution, the « dispatcher » must at once be informed.

The motive power office at the foot of the incline is to be in constant communication with the brakesmen's office at Ans station in order to transmit the orders received, and to obtain information to pass on to the « dispatcher ».

In case of urgency, the chief-brakesmen are allowed to ride on engines on the incline.

The motive power department must at once inform the « dispatcher » of changes or modifications which have to be made in the number or duties of the brakesmen and chief-brakesmen.

APPENDIX 3.

Annual balance sheet for

EXPENSES.									
INITIAL OUTLAY.						ANNUAL			
						Expenses incurred by			
						Way and Works Department.	Traffic Department.		
Section of line equipped. 1	Cost of wires. 2	Cost of labour (wires, cable, material). 3	Cost of telephone apparatus. 4	Cost of sundry material. 5	Total amount of first cost. 6	Cost of maintenance, repairs and electric current. 7	Salaries and expenses of « dispatchers ». 8	Salaries and expenses of additional telephone operators. 9	Total for Traffic Department. 10
	Fr. C.	Fr. C.	Fr. C.	Fr. C.	Fr. C.	Fr. C.	Fr. C.	Fr. C.	Fr. C.
Brussels to Ostend, Brussels West Suburban and Schellebelle to Termonde	433 962.50	135 445.00	149 161.53	141 874.45	860 443.48	10 000.00	187 965.00	52 882.50	187 965.00
Brussels to Ans.	325 710.00	190 672.87	145 965.20	241 491.51	903 839.58	9 000.00	118 276.00		118 276.00
Ans to Herbesthal.	145 200.00	68 149.00	83 862.34	61 263.75	358 475.09	8 000.00	115 517.00		115 517.00
Brussels to Ciney.	231 000.00	207 748.36	158 065.41	139 060.91	735 874.68	8 000.00	106 475.00		159 357.50
Ciney to Arlon.	567 600.00	123 930.00	95 300.00	114 597.46	901 427.46	9 000.00	109 723.00		109 723.00
Total. . .	1 703 472.50	725 945.23	632 354.48	698 288.08	3 760 060.29	44 000.00	637 956.00	52 882 50	690 838.50

Total length of line operated by the « dispatching system » being 508 kilometres (316 miles), the annual the « dispatching system ».

APPENDIX 3.

EXPENDITURE.		SAVINGS.				
		FOR THE WHOLE OF THE LINES OPERATED.			Total saving for the railway as a whole.	Credit balance (saving less expenditure).
Capital charges (assuming 10 °/. interest and depreciation). 11	Total annual cost. 12	Saving as regards salaries and expenses of train staffs. 13	Saving in fuel, lubricants, etc. 14	Saving realised in working banking engines on the Liége inclines. 15	16	17
Fr. C.	Fr. C.	Fr. C.	Fr. C.	Fr. C.	Fr. C.	Fr. C.
86 044.35	284 009.35					
90 383.96	217 659.96	12 376 753.60	2 346 304.00	376 596.00	15 099 653.60	13 988 809.07
35 847.50	159 364.50					
73 587.47	240 944.97					
90 142.75	208 865.75					
378 006.03	1 110 844.53	12 376 753.60	2 346 304.00	376 596.00	15 099 653.60	13 988 809.07

reduction of the cost of operation per kilometre of line is fr. 27 537.02.

[725 .33 (.42)]

England's first reinforced concrete engine house,

By D. R. LAMB,
Editor, *Modern Transport*, London, England.

Figs. 1 to 7, pp. 397 to 401.

(*Railway Age.*)

The Southern Railway of England has recently completed the construction of an engine terminal at its new Feltham classification yard, the engine house of which is believed to be the first of its kind in Great Britain to be built entirely of reinforced concrete. The Feltham classification yard has been in use since October 1921, and pending the erection of an engine house on the site, it has been served for locomotive purposes by the Strawberry Hill engine terminal about 12 miles away, an arrangement which has necessarily resulted in a considerable amount of light running. This will now be avoided, and with the opening of the new engine house all of the work at Strawberry Hill will be transferred, together with the staff, to Feltham.

The yard extends from west to east parallel with the main line. At the west end, adjacent to Feltham station, and under the control of Feltham East signal tower, it commences with a series of eight eastbound receiving tracks, each capable of accommodating trains of from 60 to 70 cars. These tracks converge into one lead passing over the eastbound hump to 14 classification tracks, which connect at their eastern end with a departure yard, which is under the control of Feltham signal tower. In the same way, westbound trains enter the yard at the eastern end and run into a series of six receiving yard tracks, next passing over the westbound hump to the westbound classification yard containing 17 tracks, the departure tracks from which are controlled by Feltham East tower. Between the east and westbound yards are located a car repair shop and stock pens. In addition, there is at the western end a further series of eight sub-classification tracks, each capable of holding 30 freight cars, which are used for the classification of trains in station order.

The engine terminal.

The new locomotive terminal at Feltham is situated at the southeastern extremity of the classification yard. It comprises an engine house capable of accommodating 42 locomotives, together with a water tank of 120 000 gallons capacity, a mechanical coaling plant with a bunker capacity of 200 tons, an electrically-operated turntable, and coal storage grounds with accommodation for 8 000 tons of coal. From the east end of the yard it is served by a line branching off from the track leading into the westbound receiving yard, while access from the west is by means of an independent engine thoroughfare leaving the main line at Feltham East, and skirting the westbound classification tracks. Near the engine house a spur from this track passes over the turntable and then serves the house tracks and an extra set of terminal tracks south of the engine house,

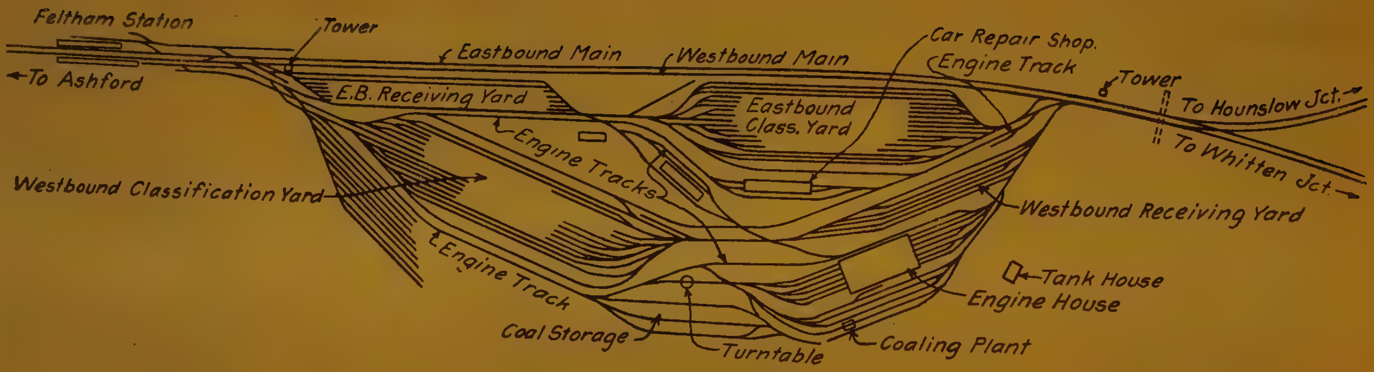


Fig. 1. — Diagram plan of the Feltham classification yard.

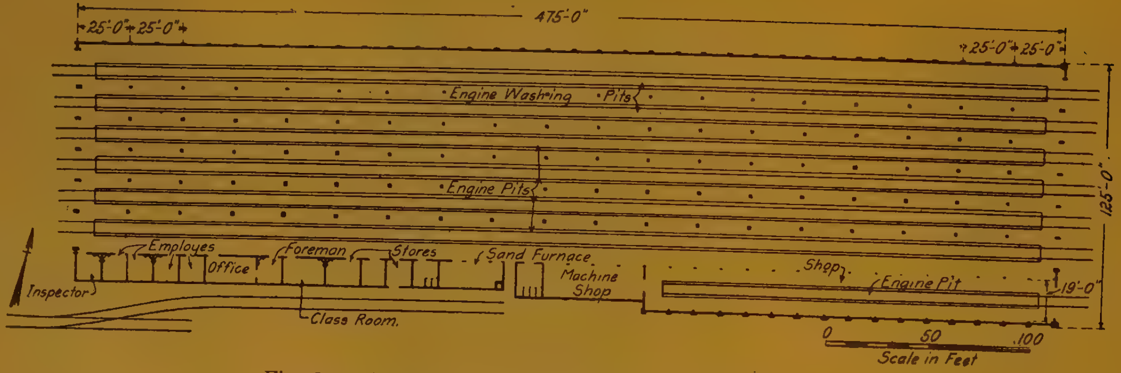


Fig. 2. — Plan of the new engine house at Feltham yards.

which are to be used for coaling, watering, and cleaning purposes. Access to the terminal may also be obtained by locomotives from the east side of the yard by means of an independent engine track from the eastbound receiving yard, which skirts the stock pens and crosses the hump lead on the west side, connecting with the engine track previously mentioned immediately north of the engine house. With these three methods of access there is no possibility of engines being delayed in passing to the locomotive terminal.

Reinforced concrete engine house.

As already mentioned, in point of construction the engine house is probably the first of its kind in England, as it is built entirely of reinforced concrete on the Hennebique system. The only exposed metal is in the sashes of the side windows; the roof windows, eaves, gutters and rainwater pipes are of reinforced concrete and the only timber used is that in the partitions of the administrative offices. The building is 475 feet in length and 125 feet in width, and can be entered by locomotives at either end. The height from rail level to the under-beam of the cross girders is 14 ft. 8 in., and from rail level to under-side of smoke trough 14 ft. 1/2 in. The roof, which is of the saw-tooth type, consists of 19 spans, each of 25 feet. The southern portion of each span is of concrete, and the northerly portion of glazing, the north-light principle being followed throughout. The roof glazing bars are of armored concrete. Both walls are liberally equipped with windows: the whole engine house, in fact, is exceptionally well lighted; the interior walls being finished in lightcolored distemper. Along the southeast side of the engine house are situated the various offices, lobbies and stores, a noticeable feature of this accommodation being a class-room in which it is proposed to give lectures to cleaners and junior enginemen on the operation of the locomotive, and also to hold first aid classes. Beyond the office and lobby accommodation is a very light and airy machine shop, 50 feet in length by 15 feet in width, equipped with the latest appliances.

The erecting shop.

Connecting with the machine shop by a sliding door is the erecting shop, 200 feet in length by 22 feet in width. This shop, which is equipped with engine pits and catch basins, is 32 ft. 6 in. in height, an allowance which will give ample head room for a 50 ton travelling crane operating on rails mounted on concrete beams extending the full length of the shop. This travelling crane is designed to lift loads of 50 tons at a speed of 4 feet per minute and to travel longitudinally at 100 feet per minute, the span being 20 feet. As no cross travelling is necessary, the hoisting gear is mounted direct on the main cross girders.

The engine house contains six stalls, to which there is access at each end, in addition to a short track into the erecting shop. An interesting feature of these stalls is the fact that the rails are carried on chairs attached to longitudinal concrete stringers in place of timber ties, as is generally used for this purpose. The ordinary type of rail and chair is used with spike and trenail fastening. Over each stall, except that in the erecting shop, is a smoke duct with jacks which project through the roof to carry off the smoke; both duct and smoke-jacks are of concrete.

The first two stalls on one side of the engine house are designed for the use of engines requiring washing out, and are equipped with the usual engine washing pits and catch basins. Between these two stalls there are 13 hydrants, a number which should prove ample to meet all possible needs for wash-out

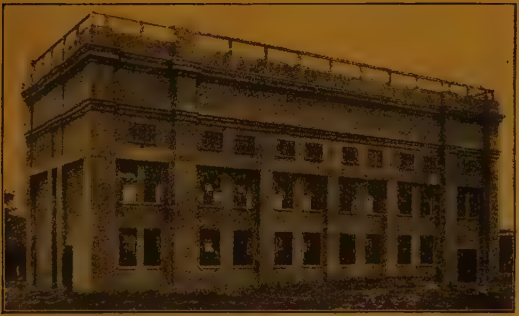


Fig. 3. — The reinforced concrete tank house at the new Feltham terminal.

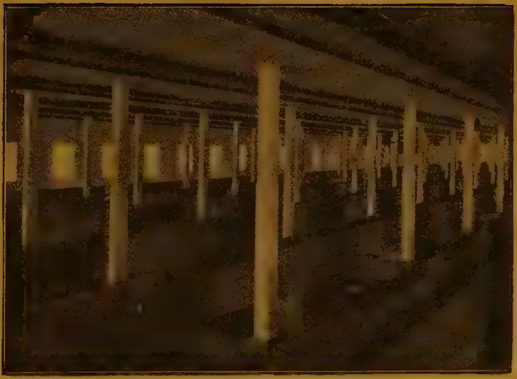


Fig. 4. — The smoke ducts are continuous with smoke jacks located at intervals.

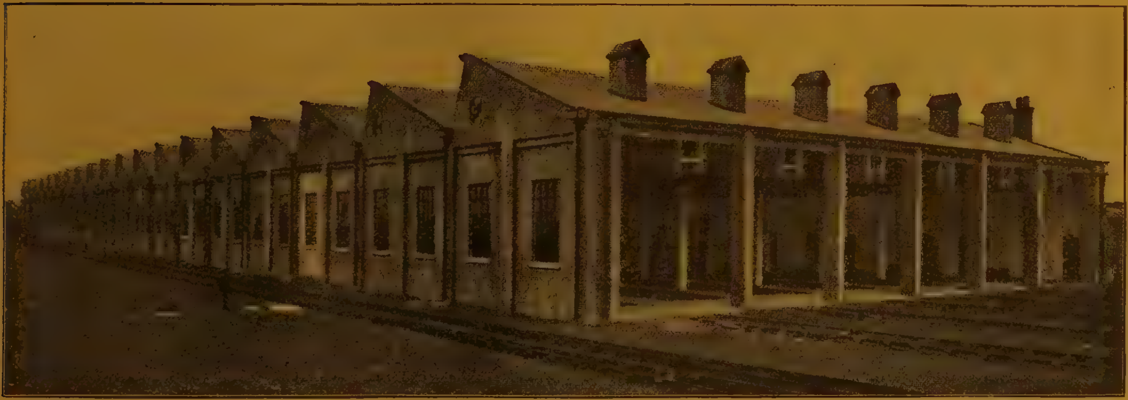


Fig. 5. — The exterior and roof construction is well indicated here.

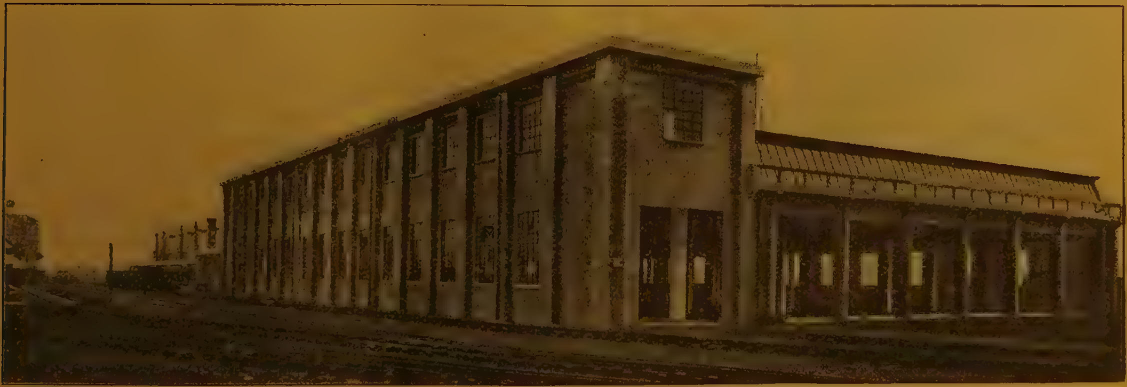


Fig. 6. — The erection shop side of the structure.

purposes. The remaining four stalls are intended to be utilized for ordinary oiling and cleaning purposes, although, as they are equipped with 14 hydrants, they can, if necessary, also be used for washing out. The floor of the engine house is of blue brick paving or concrete, the engine pits being of concrete with brindle brick facing and concrete copings. The offices have wood block floors. The engine terminal is exceptionally well provided with water columns, there being three between the tracks at the west end of the engine house, a similar number at its east end, and one placed between the coaling tracks on the south side of the engine house.

The tank house.

The tank house, which is also built entirely of reinforced concrete, presents a very attractive appearance. It measures 84 ft. 6 in. in length by 34 ft. 3 in. in width. It has two floors and a pipe chamber above them, giving access to the control valves, the tank itself being at the top of the building. It is possible for the two floors, which are spacious and well lighted, to be used for the purposes of a mess-room and an institute or as dormitories for the employees at Feltham yard. The company is also providing 128 dwelling houses in the neighbourhood of the yard for the accommodation of its employees.

As there is no adequate drainage system at Feltham, the company has had to make provision for the treatment of soil and washing-out water, and a complete filtration system has been introduced. The washing water from the boilers is conveyed through underground ducts into a large tank, 24 feet long by 12 feet wide by 14 feet deep, from which it is pumped and passed through a wood-wool filter the effluent being discharged into the surface drains. There is, however, a scheme under consideration for using the water over again, but that is more or less in abeyance until such time as the company can actually determine the analysis of the filtered water. If it is found to be free from oil or other impurities, arrangements will be made to use it again.

The coaling plant

The mechanical coaling plant is remarkably compact and occupies a minimum of siding space. Extending practically over three tracks, it is less than twice the length of a coal car, but its height is over 70 feet. It consists of a storage bunker built of reinforced concrete and having a capacity of 200 tons, which is fed by means of a patent car tippler hoist. This machine will lift coal cars from rail level to a height of 40 feet and will then turn them almost upside down; after their contents have been emptied into the storage bunker, the cars are returned to rail level. It is estimated that the storage bunker can be filled in this manner in about 45 minutes, the average time taken to supply a locomotive with the requisite amount of coal being 2 minutes. By an ingenious design the storage bunker can deal with two different qualities of coal, and although these are fed through the same opening at the top, they can be discharged at will into locomotives passing on either of two tracks.

The labor involved in taking coal from cars and placing it in the locomotive tenders appears to have been reduced to a minimum. Only one man will be necessary to operate the tippler hoist, and, owing to the capacity of the storage bunker, his services will merely be required during the busiest hours of the day. The only other labor necessary will be one man on each shift to operate the gates, which are placed under the storage bunker. These gates are arranged to measure the coal as it passes to the tender, in this way enabling a record to be kept of the coal consumption. The design of the machine is such that no damage is done to the cars during the hoisting process. The car is lifted in a cradle and tipped by means of an electrically-driven winch, the load being balanced by means of weights running in vertical guides, an arrangement which reduces the power consumption to a minimum. It will be possible to coal four locomotives, providing they are standing back to back, but normally two engines will be coaled simultaneously, the operation occupying but a few minutes.

Fig. 7. — Excellent lighting has been obtained as is evidenced by this photograph.

Electric turntable.

The engine turntable, which is 65 feet in diameter, will be operated electrically. In this case the use of timber has been restricted as much as possible, the circle rail being secured to the concrete without the intervention of timber ties. The turntable will be operated from an adjacent cabin, the operator also being responsible for the operation of the main switch giving admission into the tracks on the west side of the terminal. Telephone communication is being provided between the turntable operator's cabin and the engine house foreman's office to regulate the movement of locomotives in and out of the terminal.

These additions to the Feltham hump yard have been designed by A. W. Szlumper, chief engineer of the Southern railway. All of the reinforced concrete work is on the Hennebique system. The construction of the engine house and tank house, together with the reinforced concrete work in the coaling plant, has been carried out by Holloway Brothers, Limited, London. The track and other sections of the work have been carried out by the staff of the Southern railway.

MISCELLANEOUS INFORMATION

[625 .144.4 (.73)

1. — Photographic chart illustrates standard method of rail cutting.

Figs. 1 to 6, pp. 403 and 404.

(*Railway Review.*)

There is no doubt but that a great many operations performed in the course of a day's work on which no definite instructions are issued and for which no standards have ever been established, are gone about in a haphazard fashion, with consequent loss of time and material and to which many an injury could also be ascribed. Perhaps many of these tasks could be made less hazardous and also be performed more efficiently if detailed instructions were issued in every possible and practicable instance. The initiation of such ideas is both interesting and refreshing.

As a forward step in the education of maintenance of way employees in the proper methods to be followed in the cutting of rail with sledge and chisel, Mr. H. M. Lull, chief engineer of the Texas & Louisiana division of the Southern Pacific Co., has recently issued a most comprehensive photographic chart showing the progressive steps necessary in performing this particular operation. These charts combine the six illustrations that are shown herewith, and are accompanied by detailed instructions of each step to be taken and the manner in which the work is to be done.

Copies of this chart are being placed in each section tool-house, and instructions have been issued to all track supervisory officials and subordinates to see that the instructions outlined thereon are strictly adhered to. It is the belief of the engineering department of the Southern Pacific that in standardizing this work, it will not only insure a more uniform job of rail cutting, but also that the chances of accident to the men will be materially decreased.

The instructions accompanying the photograph are given here in full, applying to each illustration of the various steps, showing the proper method for doing this work :

1° (fig. 1) : Begin by carefully instructing men how to place their hands and feet to avoid accident. Make a pencil or chalk mark entirely around the rail at a point where the cut is to be made. Do this carefully as a guide line for chisel so that the cut will be square. Use a good sharp chisel, also sledge, instead of spike maul. Place rail in position shown in photograph No. 1, and cut base with chisel about 1/8 inch deep from edge of base to the web. Do this on both sides. Follow the guide line closely with the chisel;

2° (fig. 2) : Place rail as shown in photograph No. 2, and cut edge of base about 1/4 inch deep, exactly on guide line. Do this on both sides. In turning rail, men should not take hold of it close to the blocks on which it rests : there will then be no danger of mashed fingers. In figure 2, the chalk mark guide line is clearly shown;

3° (fig. 3) : Place the rail in position as shown in photograph No. 3 : with base up. Cut with chisel along the guide line about 1/8 inch deep for the entire width of the base;

4° (fig. 4) : Place the rail in position shown in photograph No. 4. Men with bars put strain on rail while a few blows are struck with chisel point on guide line on web of rail. This will cause a crack to start at edge of rail base on under side of rail. Rail should then be turned over and operation repeated on the other side;

5° (fig. 5) : When cracks have been started

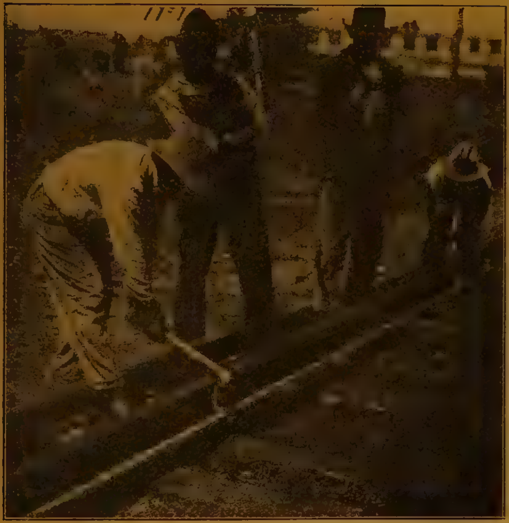


Fig. 1. — Rail should be marked with chalk where cut is to be made.

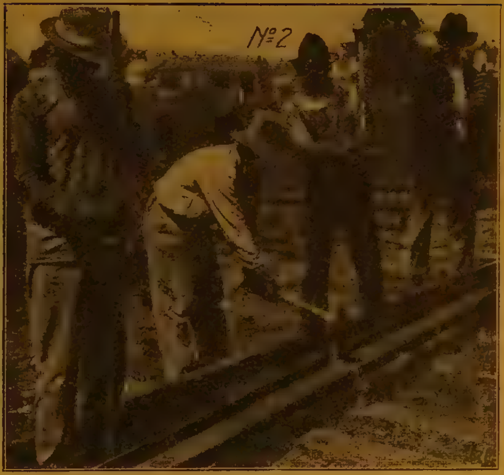


Fig. 2. — Proper position of rail in cutting edge.

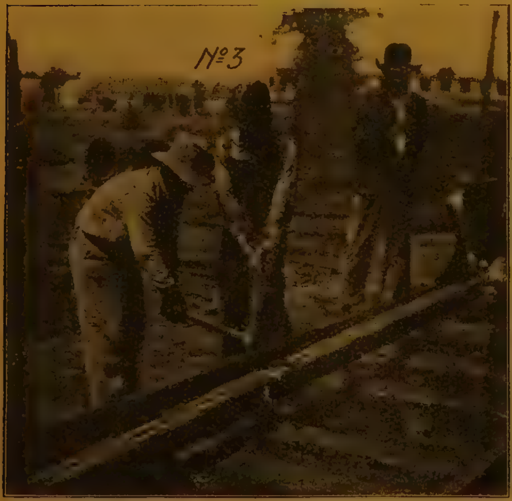


Fig. 3. — Showing rail base up in demonstration of proper cutting method.

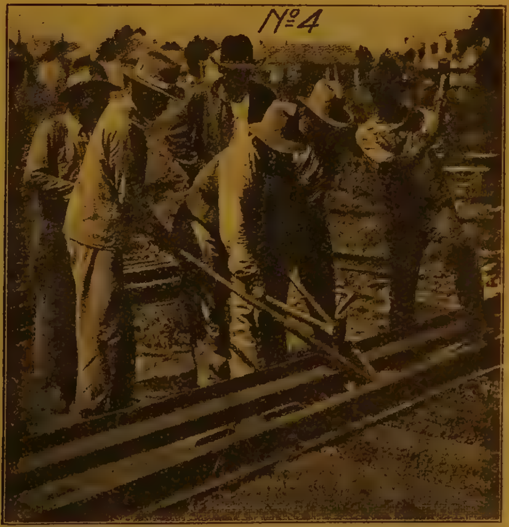


Fig. 4. — Applying strain to rail by means of bar in order to start crack at edge of rail base.

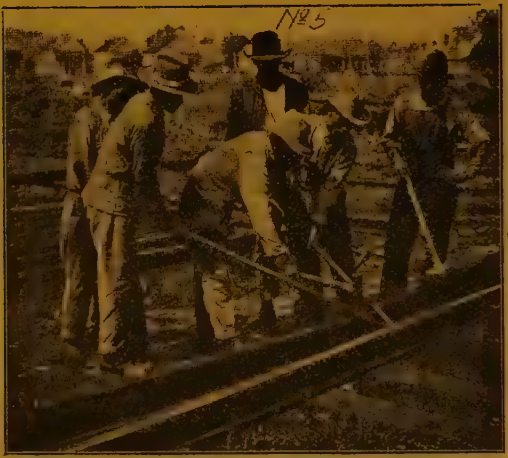


Fig. 5. — Rail set up work-ways for completing cut.

Fig. 6. — Showing the excellent results possible by following a careful and systematic method.

on both edges of rail base as described in foregoing, rail should then be set up work-ways as shown in photograph No. 5. Men with bars then put heavy strain on rail while a sharp blow is struck with chisel on top of ball, on the guide line. This will cause rail to break clean and square exactly at the place desired. Photograph No. 5 was taken immediately after break was made and shows clearly last step of the operation;

6° (fig. 6): Photograph No. 6 shows the clean square break which will always result if these instructions are followed. The burrs made by cutting with chisel should be smoothed off before rail is put in track so single bar will fit properly.

The foregoing instructions in regard to this work apply mainly to rails of full length, shorter pieces being cut with a hack saw.

[621 .136.3 (.42)]

2. — Water troughs on the Great Western Railway.

Figs. 7 to 12, pp. 405 to 409.

(*The Railway Gazette.*)

The credit for arranging water pick-up systems for locomotives on railways belongs to Mr. John Ramsbottom, when in 1860, as locomotive superintendent of the London & North Western Railway, he introduced the system on that line. Other progressive railway companies in this country subsequently adopted the system. Experiments in connection with picking up water for locomotives at high speeds were first made on the Great Western Railway in the year 1895 near Goring Station, between Reading and Didcot. The success of these experiments led to many installations being made in other parts of the system, which have worked with complete satisfaction for many years. In the selection of a site for water troughs consideration must be given to several points in addition to those which govern the selection of an ordinary watering station, such as a plentiful supply of water with a minimum amount of pumping, and water of such quality that it can be used without special treatment. These special considerations include the following :

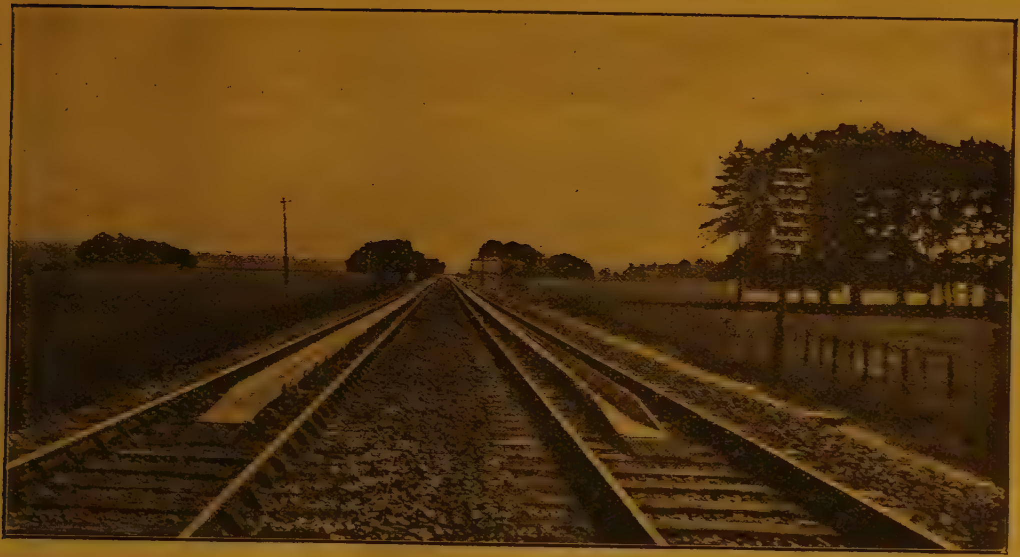


Fig. 7. — Water troughs at Exminster, Great Western Railway.

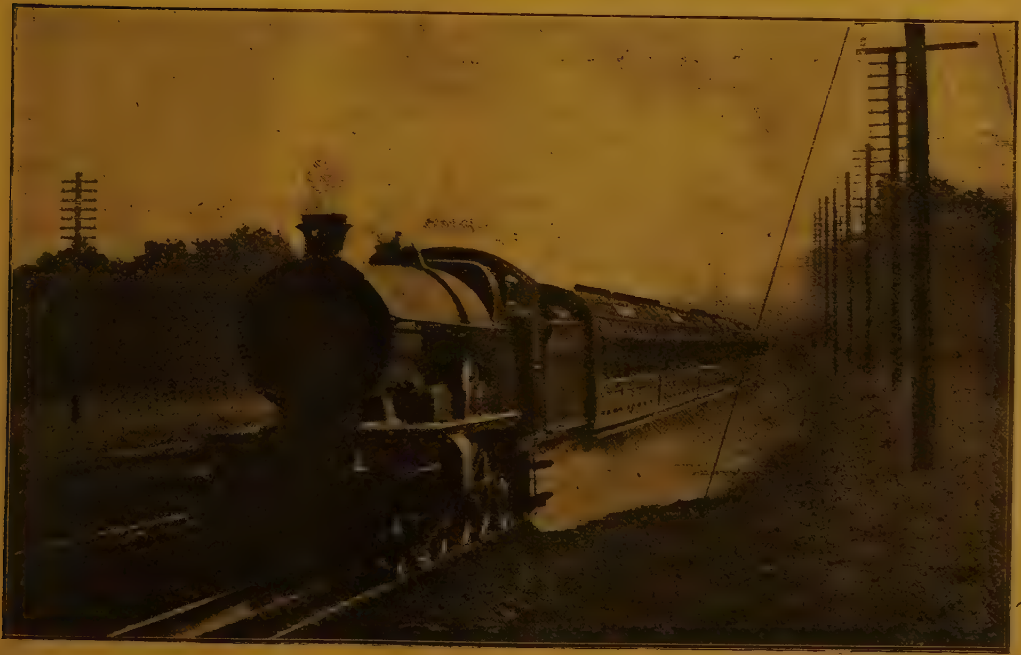


Fig. 8. — G. W. R. Express picking up water at Goring.

1° The site of the troughs must be level or capable of being levelled for a length of 600 yards;

2° It must be capable of efficient drainage;

3° It must be clear of junctions, signals, sharp curves, embankments and level crossings, so that a sufficiently high speed can be maintained over the troughs to ensure a full tender being obtained.

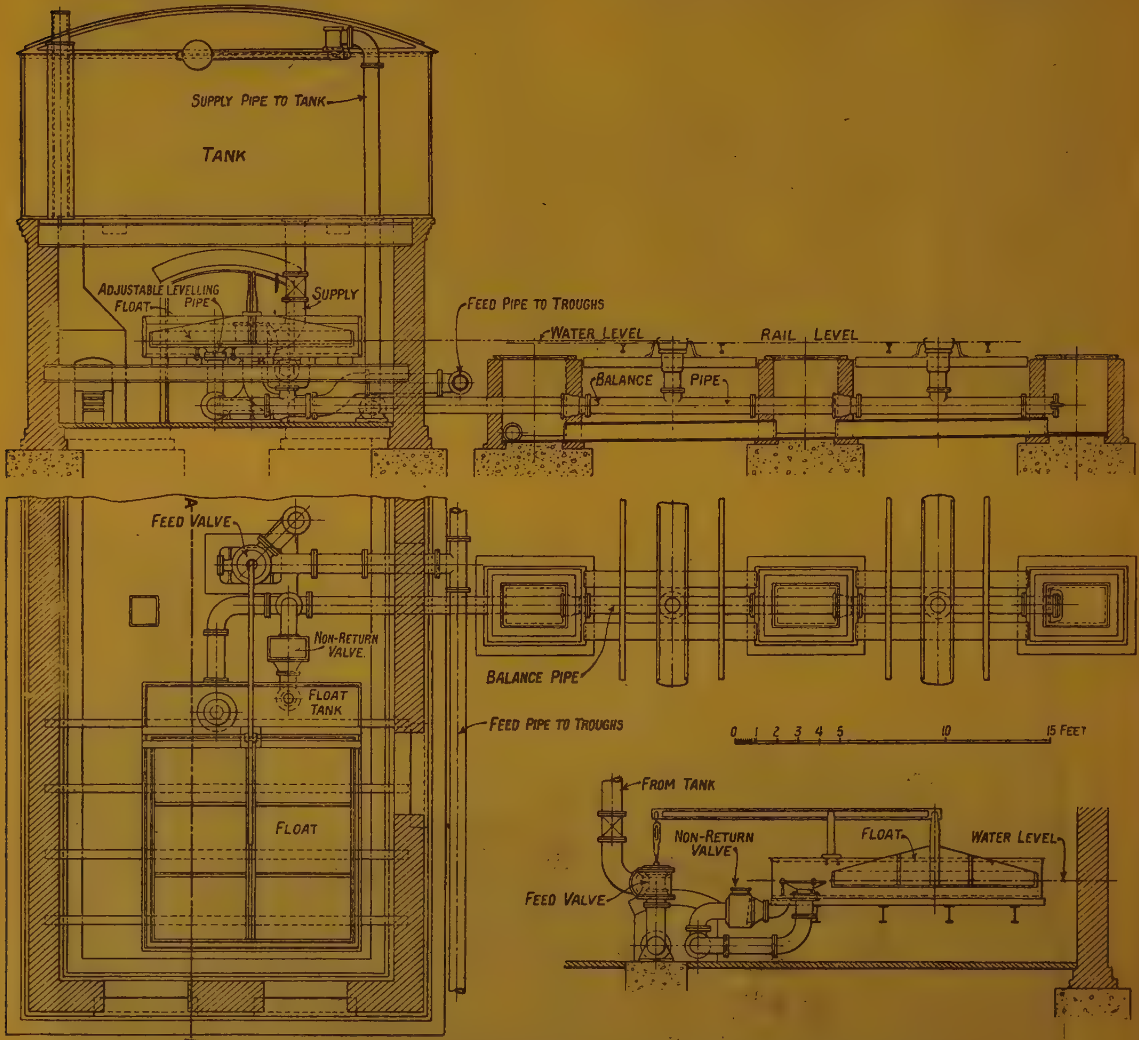
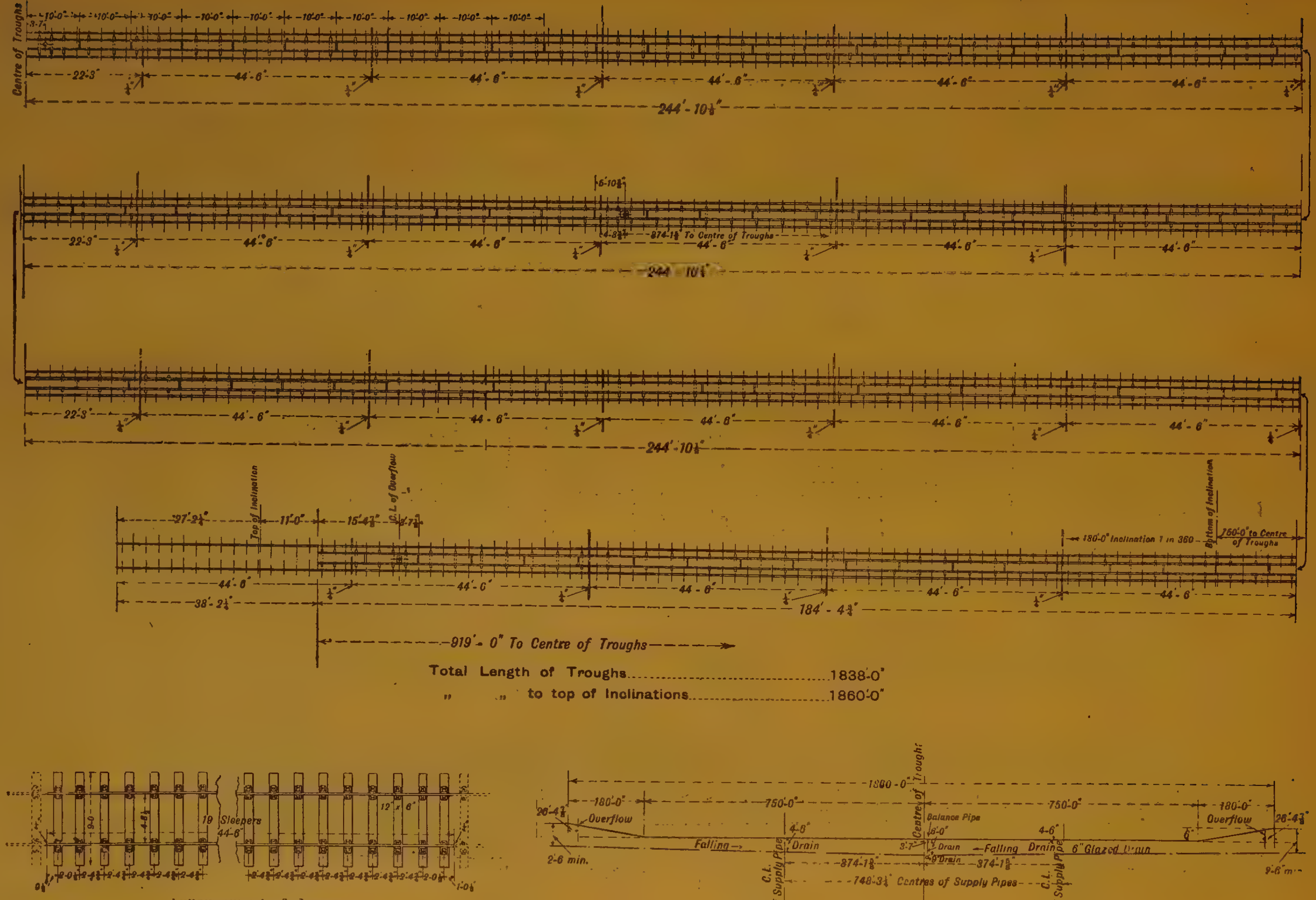


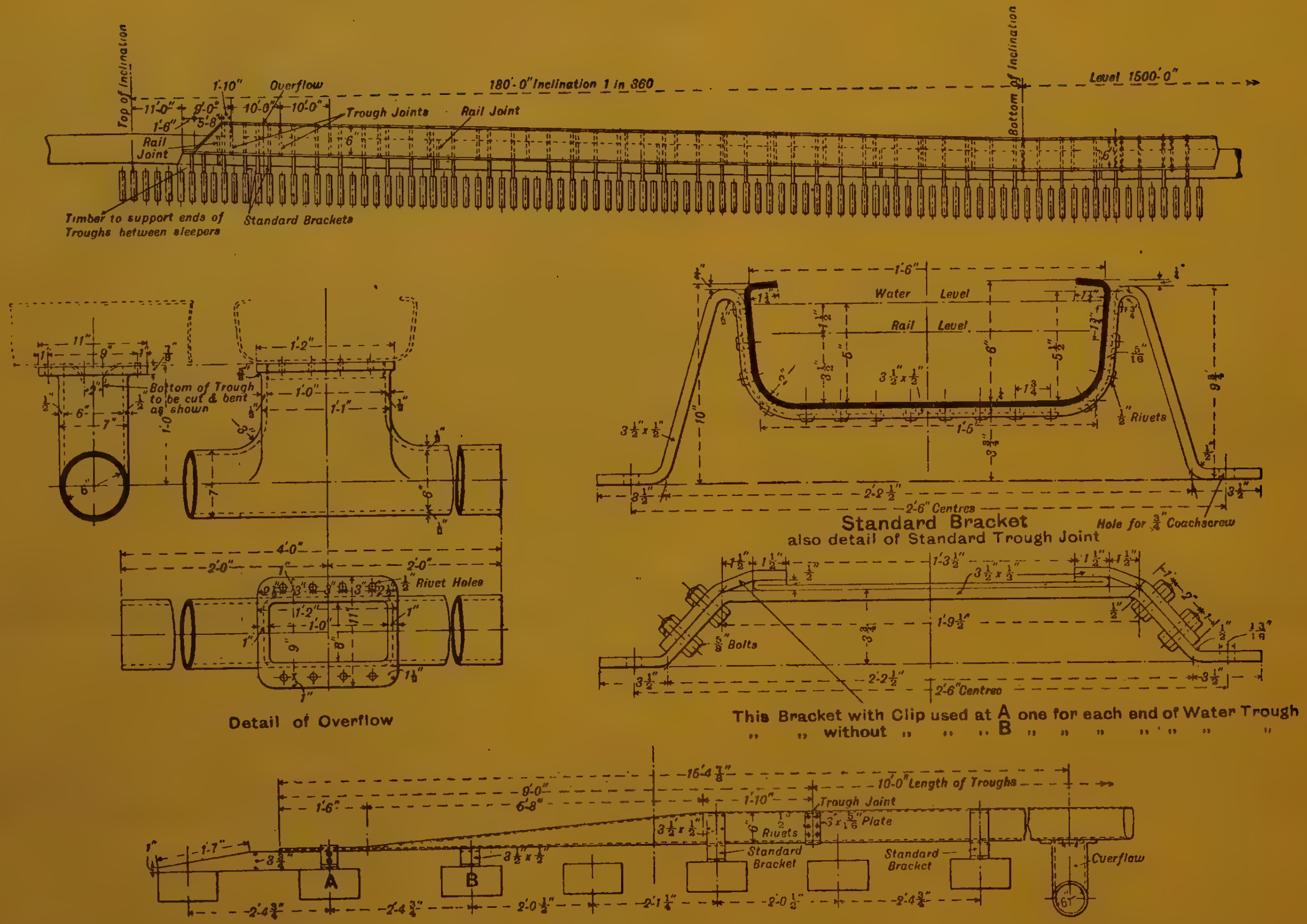
Fig. 9. — Supply and drainage pipes, etc., for water troughs, Great Western Railway.

The troughs on the Great Western Railway are made of galvanised steel 18 inches and 6 inches deep by 1/4 inch thick, with an in-turned edge on each side, which minimises splashing, and are supported on wrought-iron brackets screwed to the sleepers. The middle



Arrangement of sleepers.

Fig. 10. — Track details, Great Western Railway water trough sections.



NOTE. — Troughs are supplied in 30 foot lengths.

Fig. 11. — Details of water troughs, Great Western Railway.

portion of the track bearing the troughs is laid level, and each end, for a length of 180 feet, is inclined upwards so as to hold the water in the troughs. This arrangement allows the water scoop to be lowered before the water trough proper is reached, and it need not be raised until after the trough has been passed. The level of the water in the troughs is 1 1/2 inches above rail level. It will be noticed that, as shown in figure 10, the troughs are supported on cross sleepers instead of on longitudinal ones, as is usually done in such cases. This permits the use of standardised permanent way and obviates the need of special arrangements at the points where troughs are laid.

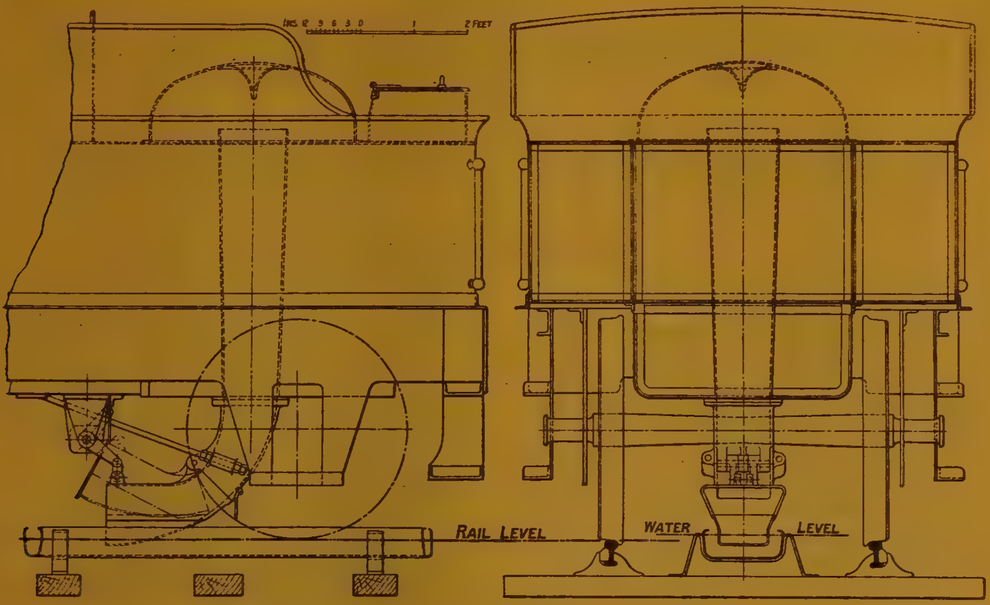


Fig. 12. Diagram of water pick-up on tenders.

From trials which have been conducted it has been proved that the best results are obtained when the speed over the troughs is about 50 miles an hour, and that no water can be picked up when the speed is less than 20 miles an hour. The automatic refilling of the troughs after an engine has taken water and the prevention of waste is accomplished by a modification of the well-known ball cock. About the centre of the trough is an 8-inch balancing pipe connected with a tank containing a float, 10 feet square, which controls the valve admitting water to the troughs. The balancing tank and valve gear are housed in a building at one side of the line near the middle of the troughs and the building supports a storage tank 40 feet by 20 feet by 8 feet.

The inlets to the troughs are at two points 325 feet on either side of the centre line and are connected by 8-inch pipes from the 10-inch pipe leading to the control valve in the tank house. Overflows are provided at each end of the troughs.

Efficient drainage must be provided owing to the amount of water spilled in taking up, and special ballast and large area drains are provided for this purpose.

[385. (06.119]

OFFICIAL INFORMATION

ISSUED BY THE

PERMANENT COMMISSION

OF THE

INTERNATIONAL RAILWAY CONGRESS ASSOCIATION

STATEMENT.

Our distinguished colleague, Mr. G. GRIOLET, vice-chairman of the Board of the Northern Railway of France and member of the Executive Committee of the International Railway Congress Association, has been raised to the dignity of Grand Officer of the Legion of Honour.

We are proud of the very high honour conferred by the Government of the French Republic upon our colleague whom we hold in so high respect, and we offer him our warmest and most sincere congratulations.

The Executive Committee.

[385. (09.2]

OBITUARY

Dr. Hermann DIETLER,

Engineer;
Late President of the Managing Committee of the Gothard Railway;
Ex member of the Permanent Commission of the International Railway Congress Association;
Delegate to the first eighth sessions;
First Vice-President of the local organising committee and President of the third section
at the eighth session (Berne, 1910).

We have heard with the deepest regret of the death of Mr. Hermann Dietler, who was from 1887 to 1911 a member of the Permanent Commission of the International Railway Congress, with the objects of which he was warmly sympathetic.

With him disappears the last link with a memorable period in the history of the Swiss railways, and one of the most eminent amongst that body of men who devoted their knowledge and talents to the carrying out of a celebrated undertaking.

The position he filled with regard to the Gothard Railway was a very prominent one, whilst he exercised a very considerable influence on the development and prosperity of this international line.

Mr. Dietler very early commenced a training, leading up to the profession of railway construction, and took, whilst yet a young man, an active part in the public life of his country at a period when the question of the laying down of lines of transport was attracting general attention.

Born at Breitenbach, in the canton of Soleure, on the 1 October 1839, at 21 years of age he finished a successful course of study at the Federal Polytechnic at Zurich, and was appointed a constructional engineer on the Oron Railway. Two years later he joined the Berne Railway, and in 1866 became cantonal engineer to his native canton. The brilliant qualities he displayed soon led to his becoming a member of the Government of Soleure as Director of Public Works. In this position, several lines of railway, certain important roads and hydraulic schemes were carried out to his designs. In 1871, at Bienne, he was engaged on the Jura line and laid out the section from Bienne to Sonceboz. From 1873 to 1879 he was manager of the Emmenthal Railway and designed the Burgdorf-Langnau line. In 1875 he started the Soleure-Burgdorf Railway. In the meanwhile he had been elected to the Council of the Canton, and afterwards to the National Council where he made his mark, not only because of his technical knowledge, but by his administrative ability.

In 1879 commenced a period which he always looked upon as being the happiest time of his life. For thirty years he was employed on a work with which his name will always be associated and of which his country will ever be proud. At the time when he was appointed to the management of the Gothard line, important work still remained to be carried out. With his fellow workers, Dietler pushed on with the completion of the line. The tunnel from Göschenen to Airolo was pierced on the 29 February 1880 and ready for operating the following year. The 1 June 1882 saw the whole length of line from Immensee to Chiasso opened for traffic The extension as far as Lucerne and the construction of the section from Arth-Goldau to Zug was carried out more slowly.

In addition to the above, he had to organise the international express service. Dietler had charge of the negotiations for making the necessary arrangements, and at the several conferences held, was able to carry through his ideas. To him were chiefly due those improvements which made the Gothard a model line, and which gave it a world wide reputation; these included the introduction of bogie coaches, provision of new locomotives and shortening of the times. He became vice-president in 1891 and president in 1908, and when the Federal authorities decided to take over the railway in 1909, had the satisfaction of handing over to the Government a line in a fully prosperous condition.

One with so enlightened a mind and so anxious to help in everything which was likely to contribute to the welfare of railways could not but be interested in our Association.

Mr. Dietler took an active part in the organisation of our Association. He was nominated as a member of the Permanent Commission at the time of the second session, which was held in Milan in 1887, when the Railway Congress was definitely formed.

In spite of his advanced age, he did not hesitate to take up the duties of first vice-president of the local organising committee for the Berne session in 1910. His knowledge of all questions relating to railway operation procured for him, amongst other things, the signal honour of being chosen as president of the 3rd section of the Berne Congress, and he carried through the work in a remarkably efficient manner.

He maintained his membership of the Permanent Comission until, in 1911, when following the purchase of the Gothard Railway by the Federal Railways, he retired from active railway service.

He carried with him into his retirement the high regard of his colleagues and the esteem and admiration of those who had seen the work he had carried out. On this occasion the Federal Technical School conferred on him the degree of Doctor of Engineering — *honoris causa.* This distinction was an acknowledgment of his scientific achievements and of his work, and at the same time a recognition of the services he had rendered to the cause of education; he had been for ten years a member of the Academic Council of the Federal Polytechnic.

Retirement did not mean for him a cessation from activity. He continued to be interested in railways. He was moreover one of the founders of the New Union of the Gothard, and was interested in the suggestion for the line on the left bank of the lake of the Four Cantons (Lake of Lucerne). His authority on and knowledge of railway matters was well known beyond his own country, and he was on several occasions chosen as arbitrator in international questions. He had the satisfaction of seeing the electrification of the Gothard completed, this being the crowning feature of his work.

He died in his eighty-fifth year after having a career which any man might envy and after having experienced the rare happiness of seeing success crown his efforts. We feel for his family sincere condolence at their loss, and offer them our respectful sympathy.

The Executive Committee.

J. W. KENDRICK,

Chairman of the board of directors of the International Great Northern;
Reporter to the session of Washington (1905) of the International Railway Congress;
Delegate at the session at Berne (1910).

We have learned with the keenest regret of the death of Mr. J. W. Kendrick, who was a reporter on question I-A (Wooden sleepers or crossties. Selection of species of timber used and processes of preservation) at the session of Washington (1905) of the railway congress.

We reproduce below a memoir of him which appeared in the *Railway Age* :

J. W. Kendrick, chairman of the board of the directors of the International-Great Northern, with headquarters at Chicago, died in that city on February 16.

Mr. Kendrick was born on 14 October 1853, at Worcester, Mass., and was graduated from the Worcester Polytechnic Institute in 1873. He entered railway service in 1878 as a levelman on the construction of the Yellowstone division of the Northern Pacific, and was engaged in the location of the Yellowstone and Missouri River divisions until 1880. In that year he was promoted to engineer in charge of construction of the Yellowstone and Missouri River divisions and he continued in this position until 1883, when he was promoted to chief engineer of the St. Paul & Northern Pacific, now a part of the Northern Pacific.

Mr. Kendrick was promoted to chief engineer of the Northern Pacific in 1888, and in July 1893, he was promoted to general manager. In February 1899, he was elected vice-president in charge of operation and he held this position until June 1901, when he was elected vice-president in charge of operation of the Atchison, Topeka & Santa Fe. He resigned this position in June 1911, to establish a private practice as consulting engineer at Chicago.

Upon the reorganization of the International-Great Northern in December 1922, Mr. Kendrick was elected chairman of the board of directors and he continued in that position until his death.

We offer to his family our most sincere condolences.

The Executive Committee.

NEW BOOKS AND PUBLICATIONS

[**531**. (02, 625 .3 (02 & 385. (04]

SCHILOVSKY (P. P.), president of the Gyroscopic Society of Petrograd. — **The Gyroscope : its practical construction and application**, with preface by professor C. V. Boys, F. R. S. — One volume in 8vo (8 1/2 × 5 1/2 inches) of VII + 224 pages, with 107 illustrations. — 1924, Published by E. & F. N. Spon, Ltd , 57, Haymarket, London, S. W. 1, and Spon & Chamberlain, 120, Liberty Street, New York. — Price : 14 sh. net.

The first four chapters of this book state the various laws governing the behaviour of the gyroscope, and give an elementary description of its more simple practical applications.

In this part of the book the laws are for the most part stated without any attempt to give mathematical proof for the same.

In chapter V, the laws are taken in the same order as in the preceding chapters, and are proved or explained mathematically, this completing the first part of the book.

The second part is devoted to a description of monorail cars, and gives details of Brennan's and Scherl's cars, as well as particulars and diagrams of projected rail cars which have not yet been constructed.

The stabilising devices employed are clearly explained in the light of the laws which have been laid down in the first part of the book, and among the projected types of vehicle described, are some extremely large cars, having a length of no less than 162 feet and a total weight, including load, of 340 tons. Electric traction is of course contemplated.

Chapter V of the second part deals with the financial aspect of the monorail, the estimated cost of construction and working expenses being tabulated in comparison with an ordinary railway.

In this part of the book it would appear that the author, who is naturally an enthusiast for the monorail system, makes some rather wild statements. In the first place it is hardly a fair comparison to compare these very large cars with the type of vehicle in use at the present day on normal railways, since if it were possible to enlarge the latter regardless of capital expenditure, there is no doubt that a considerable saving could be shown, at any rate on paper. Also it is not clear why, with the monorail system, less station buildings should be required, or why the workshops should be reduced in size and number. One would rather imagine that with the delicate and complicated mechanism which it would be necessary to fit to each vehicle that the opposite would be the case.

Again, as regards the cost of construction, it is not clear why a narrower strip of ground need be purchased, since the width of the formation is dependent more on the loading gauge than on the rail gauge.

To sum up, it may be said that the book may be read with interest from a scientific point of view, but it is doubtful whether much weight can be attached to the advantages which it claims for the monorail system from a commercial standpoint.

D. W. S.

[385. (09.1 (.460) & 385. (04]

BOAG (Geo. L.). — **The railways of Spain.** — One volume (8 1/2 × 5 1/2 inches; of 129 pages, with 45 illustrations. — 1923, London, *The Railway Gazette*, 33, Tothill Street, Westminster, S. W 1. — Price : 12 sh net.

There are very few books containing information on the railways in Spain in the English language, and this one is written by a gentleman who for several years had the management of a Spanish railway.

As is stated in the preface, the publication has been delayed owing to the war, but it is a matter of regret that so interesting a book should not, except in certain cases, contain information more recent than four years before the time it is placed before the public. It is probably correct, as stated in the preface, that at the present time prophecy is fulfilled or falsified almost before it is written, but particularly with the figures of traffic, etc., it would have been a great advantage if these had been brought nearer the date of publication.

Having said this, one must state that the book is most interesting and well written, and gives concisely a great deal of information on the subject it deals with which cannot fail to interest railway men.

In the first chapter the early history of the railways is dealt with. It is interesting to note that although George Stephenson visited Spain on behalf of British financiers at an early date, yet owing to the disastrous civil war, the first railway was not opened until 1848. British capital has never largely been invested in Spanish railroads, and of the 7 070 miles of broad gauge open, half the capital of the three large companies who control 5 500 miles is held in France, With these companies the shares only amount to one third to one fourth of the debentures.

The second chapter deals with the principal lines and connections, and points out that general arrangement is that of lines radiating from Madrid, which is about 2 000 feet above sea level. The many reasons for the comparatively slow speed is dealt with.

The staff, which in 1918 amounted to 85 000 employees in all, is the subject of the third chapter, which contains a chart showing the typical organisation on a Spanish railway and which does not vary much from that commonly employed in Europe. The arrangements made for pensions, travelling facilities for the staff, seem to be up to those granted on any European line.

The next two chapters, dealing with statistics and rates and fares, are of great interest, and it is here unfortunately that one feels most the fact that the figures are not closer to the present day results.

In chapter VI, on Permanent Way, Signals and Rolling stock, it is stated that the Spanish gauge of 5 ft. 6 in. is not the result of a decision of the Minister of War based on strategical reasons, but of a report of Spanish engineers in 1844, in which strange to say the French railways were not mentioned.

Chapter VII discusses the future of the railways, and points out that the concessions for many of the more important lines have only 30 or 40 years to run and that the Government has in many ways already benefited considerably from the railways. The question of nationalisation before the concessions fall in has been discussed, but it is pointed out that the advantages and disadvantages of this are not understood by the general public.

In this chapter is a note by the Author dealing with certain matters which have occured since the war and up to 1922. The chief of these has been the appointment of a Railway Council consisting of six State officials, six members appointed by the railway companies and three by the trading interests which took over the fiscalising functions of the existing railway department of the State.

The book concludes with a chapter on the railways of Portugal, tables of the companies, length of their lines, the Railway Law of Spain of 1877, and a bibliography.

D.

[**621 .8 & 385. (04**]

NACHTERGAL (A.), engineer, technical school professor. — **Calcul et construction des ponts roulants (Calculations for and construction of overhead cranes)**, 2nd edition. — One volume in 8vo (11 × 7 inches) of 80 pages, with 113 figures in the text. — 1923, Brussels, Publishers, Alb. De Boeck, 265, rue Royale. — Price : 15 francs.

This book is a veritable treatise on the construction of metal bridges. It will evidently be of assistance to designers and technical men employed in drawing offices.

One finds the procedure necessary to draw out, as rapidly as possible, a working drawing for an overhead crane. The numerous numerical examples of crane types also allow a comparison being made between them.

It is, however, regretable that the author has not dealt with the details of the study of lines of elasticity and lines of influence, which make graphical methods so simple.

The following extract from the index gives an idea of the problems dealt with:

Chapter I : General; Chapter II : Single rolling load; Chapter III : Single girder overhead cranes; Chapter IV : Two rolling loads at constant intervals; Chapter V : Bridges with two girders; Chapter VI : Girders with solid webs; Chapter VII : Lattice girders; Chapter VIII : Various notes.

J. V.

[**624. (01, 721. (01 & 385. (04**]

Calculs pratiques de constructions métalliques (Practical calculations for metal structures) (*1st series*), by various contributors to the review : *La résistance des matériaux* (*The strength of materials*). — One volume in 8vo (10 × 6 1/4 inches) of 110 pages, with 146 figures in the text. — 1922, Brussels, Publishers, Alb. De Boeck, 265, rue Royale. — Price : 8 francs.

This book contains fourteen examples of the calculations for metal structures. Each of these examples, given with full details, represents the application of the strength of materials to a particular case. Numerous diagrams accompany the text.

The problems dealt with are as follows :

Rolling load carried by a 82 foot lattice girder; study of a lattice cross girder; inclined plane for quarries; calculations for a hand travelling crane to carry 25 t. with a span of 46 feet; bridge of 26 feet with free under passage; road bridge, 14 ft. 9 in. span; metal framework; road bridge, 78 foot span; calculations for a three pin arch subjected to a single load P; road bridge, 147 foot span; steel viaduct; steel structure on stonework pillars; footbridge for sorting siding; 13 foot span over bridge.

This book gives everything of interest to the beginner.

J. V.